

79-02

STACKS - S.B.T.,



HSL No. 79-02
FEBRUARY 1979

Highway Safety Literature

U.S. Department of Transportation National Highway Traffic Safety Administration

File 016-614862 (151)

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SAE: Society of Automotive Engineers, Dept. HSL, 400 Commonwealth Drive, Warrendale, Pa. 15096. Order by title and SAE report number.

TRB: Transportation Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

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ABSTRACT CITATIONS

SAMPLE ENTRIES

FORMAT OF ENTRIES IN HIGHWAY SAFETY LITERATURE

NHTSA accession number _____ HS-013 124

Title of document _____ **MAXIMUM BRAKE PEDAL FORCES PRODUCED BY MALE AND FEMALE DRIVERS**

Abstract _____

The object of this research was to obtain data concerning the maximum amount of brake pedal force that automobile drivers were able to sustain over a period of ten seconds. Subjects were told to apply the brakes in the test car as they would in a panic stop, and to exert as much force as possible on the pedal over the entire ten second test period. A total of 84 subjects were tested, including 42 males and 42 females. The results indicated that there is a wide distribution of values which characterizes the pedal force that the subjects were able to generate. Male subjects produced generally higher forces than did females. Over half the women tested were unable to exert more than 150 lbs. of force with either foot alone, but when both feet were applied to the pedal, force levels rose significantly.

Personal author(s) _____ bv C. R. VonBuseck

Corporate author (or author's affiliation) _____ General Motors Corp.

Publication date; pagination _____ 1973? ; 18p

Supplementary note _____ Excerpts from 'Maximum Parking Brake Forces Applied by Male and Female Drivers (EM-23) BY R. L. Bierley, 1965, are included.

Availability _____ Availability: Corporate author

NHTSA accession number _____ HS-018 924

Title of document _____ **NATURAL FREQUENCIES OF THE BIAS TIRE**

Abstract _____

The lowest natural frequencies of a bias tire under inflation pressure are deduced by assuming the bias tire as a composite structure of a bias-laminated, toroidal membrane shell and rigorously taking three displacement components into consideration. The point collocation method is used to solve a derived system of differential equations with variable coefficients. It is found that the lowest natural frequencies calculated for two kinds of bias tire agree well with the corresponding experimental results in a wide range of inflation pressures. Results of the approximate analysis show that the influences of the in-plane inertia forces on natural frequency may be considered small, but the influences of in-plane displacements are large, particularly on the natural frequency of the tire under low inflation pressure.

Personal author(s) _____ by Masami Hirano; Takashi Akasaka

Journal citation _____ Publ: Tire Science and Technology v4 n2 p86-114 (May 1976)

Publication date _____ 1976; 6refs

Availability _____ Availability: See publication

HS-022 771

POINT-FOLLOWER AUTOMATIC VEHICLE CONTROL: A GENERIC ANALYSIS. FINAL REPORT

An investigation is reported of the generic characteristics of the point-follower (or moving-cell) approach to the control of longitudinal speed and spacing of vehicles in an automated guideway transit (AGT) system, under which vehicles are constrained to follow electronic signals that move along the guideway with predetermined speeds and spacings. The first part of the study involves a kinematic analysis of point-follower control during speed transitions and point-transfer maneuvers that are generally required to resolve merge conflicts. This analysis considers the effects of operational parameters such as line speed, acceleration and jerk limits, vehicle length, headway, and length of maneuvering regions to accomplish merges. The second part presents a dynamic analysis of point-follower control, formulated as a problem in class control theory. The final part of the study addresses the traffic merging problem by development of quasi-synchronous control algorithms for resolution of merge conflicts at network intersections of various geometries. The performance of each algorithm developed in the study was evaluated by computer simulation.

by S. J. Brown, Jr.
Johns Hopkins Univ., Applied Physics Lab., Johns Hopkins
Rd., Laurel, Md. 20810
DOT-UT-30010
Rept. No. UMTA-MD-06-0022-77-1; PB-270 354; 1977; 159p
11refs
Availability: NTIS

HS-023 659

INTER-INDUSTRY EMISSION CONTROL PROGRAM 2 (IIEC-2). PROGRESS REPORT NO. 4

Fourteen papers are presented which are related to progress made during the Inter-Industry Emission Control (IIEC) program, established in Apr 1976 by Ford Motor Co. and Mobil Oil Corp. as a cooperative effort to accelerate development of a virtually emission-free, gasoline-powered vehicle by combining expertise from both the petroleum and automotive industries. Papers cover such topics as the history of the program; optimization of fuel and vehicle parameters; engine control optimization for smaller passenger cars; effects of engine variables and exhaust gas recirculation on emissions and fuel economy (Pt. 4); unregulated emissions from a programmed combustion (PROCO) engine powered vehicle; single-cylinder PROCO engine studies; octane requirement increase (ORI) of today's vehicles (Pt. 3); influence of cooling system variables on ORI; evaluation of three-way catalysts (Pt. 3); effect of air/fuel ratio modulation on conversion efficiency of three-way catalysts; 50,000 miles vehicle road test of three-way catalysts and oxides of nitrogen reduction catalyst systems; atypical fuel volatility effects on driveability, emissions and fuel economy of stratified charge and conventionally powered vehicles; fuel volatility effects on driveability of vehicles equipped with current and advanced fuel management systems; and influence of fuel characteristics on vaporization in the S.I.

(spark ignition) engine cylinder during cranking at low temperature.

Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pa. 15096
Rept. No. SAE-SP-431; PR-4; 1978; 186p refs
Includes HS-023 660--HS-023 673. Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978.
Availability: SAE

HS-023 660

THE INTER-INDUSTRY EMISSION CONTROL PROGRAM--ELEVEN YEARS OF PROGRESS IN AUTOMOTIVE EMISSIONS AND FUEL ECONOMY RESEARCH

The Inter-Industry Emission Control (IIEC) program is reviewed in terms of its evolution, goals, accomplishments, and contributions in the form of publications and patents. The IIEC was established in Apr 1967 by Ford Motor Co. and Mobil Oil Corp. as a cooperative effort to accelerate development of a virtually emission-free, gasoline-powered vehicle by combining expertise from both the petroleum and automotive industries. As national emission standards were being met during the life of the program and as energy conservation was growing as a national goal, the objectives of IIEC were changing also. The program was divided into two periods, IIEC-1 (Apr 1967-Dec 1973) with membership growing to 11 companies, and IIEC-2 (Jan 1974-Dec 1977) with 9 member companies, as its goals were broadened to include energy conservation. Using a system-oriented approach to combine basic laboratory studies and on-the-road vehicle testing, IIEC-1 was involved in 23 different projects in the following broad areas: exhaust hydrocarbon (HC) and carbon monoxide (CO) control, nitrogen oxides (NO_x) control, evaporation loss control, and concept vehicle systems embodying the developments from the first three areas. Building on the accomplishments of IIEC-1, the program goals were extended in 1974 to cover fuel economy, driveability, and durability. Projects during IIEC-2 were conducted in the broad areas of optimization of engines and petroleum-based fuels; the interrelationships of emissions, fuel economy, compression ratio, and octane requirements; alternate fuels; alternate powerplants; catalysts for NO_x reduction; three-way catalysts; air-fuel ratio control; and construction and demonstration of a concept vehicle incorporating the most promising advances identified in the other project work. The IIEC program has contributed substantially to the automotive emissions control literature, as well as many U.S. and foreign patents; lists of publications/patents are provided.

by L. J. McCabe; W. J. Koehl
Mobil Res. and Devel. Corp.
Publ: HS-023 659 (SAE-SP-431), "Inter-Industry Emission Control Program 2 (IIEC-2). Progress Report No. 4,"
Warrendale, Pa., 1978 p1-8
Rept. No. SAE-780588; 1978; 127refs
Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978.
Availability: In HS-023 659

HS-023 662

HS-023 661

OPTIMIZATION OF FUEL AND VEHICLE PARAMETERS

Octane number requirement (ONR) mapping of an 8:1 CR (compression ratio) Ford 2.3-liter engine was carried out under dynamic conditions at 1", 3", and 6" vacuum accelerations. Equations were developed relating ONR's to engine rpm, manifold vacuum, spark advance (SA), air-fuel ratio (A/F), and exhaust gas recirculation (EGR) rate. These equations, together with extensive emissions and fuel consumption data, were used to determine whether ONR's constitute a limiting constraint in the optimization of engine-vehicle systems. In addition, steady-state and dynamic ONR's were compared at 9:1 CR. The results indicate that dynamic ONR's cannot be predicted from limited steady-state requirements data. It is concluded that the dynamic ONR mapping method outlined is more effective and efficient in accurately predicting CRC (Coordinating Research Council)-type ONR's of vehicles and should be used in optimization studies. In addition, the dynamic method also defines the peak ONR(s) of the engine which could be the limiting constraint for engine optimization studies. Furthermore, there are significant differences in exhaust emissions and fuel economy trends for nominally identical engines. Although the optimization study showed that ONR was not as important a constraint as exhaust emissions in the Ford 2.3 liter engine, at 8:1 CR, ONR may be very important in other engines. The optimization method can be equally applied to other engines and conditions.

by T. R. Nesmith; C. B. Tracy; G. H. Meguerian; B. D. Keller; E. E. Daby

Amoco Oil Co.; Ford Motor Co.

Publ: HS-023 659 (SAE-SP-431), "Inter-Industry Emission Control Program 2 (IIEC-2). Progress Report No. 4,"

Warrendale, Pa., 1978 p9-19

Rept. No. SAE-780589; 1978; 12refs

Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978.

Availability: In HS-023 659

HS-023 662

ENGINE CONTROL OPTIMIZATION FOR SMALLER PASSENGER CARS

The optimization of an engine-three-way catalyst-vehicle system for best fuel economy under the constraints of emissions and driveability, was studied for a smaller passenger car with 1.6-liter, 4-cylinder engine. Full utilization of a computer was intended for the accumulation of basic data and a search for optimum calibration. An Automatic Engine Test System (AETS) was developed. The optimum calibration was calculated for the engine-vehicle system with three-way catalyst based on the optimal control theory, and was implemented on an actual vehicle by an engine controller in which a 16-bit microprocessor controlled the air-fuel ratio (A/F), spark timing, and exhaust gas recirculation (EGR) rate according to the preloaded calibration program. By using the AETS, the manpower required for data accumulation was reduced to one-tenth of that required by a customary manual method. The modified vehicle simulation program has shown enough accuracy to predict not only total emissions and fuel economy, but also their time history along the driving cycle, except for hydrocarbon (HC) emission. The optimum calibration studies under various emission constraints indicated that, in general, the leaner A/F, larger amount of EGR and MBT (minimum

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spark for best torque) calibrations were advisable. Also, the chance of using the stoichiometric A/F calibration increased under the tougher nitrogen oxides (NOx) emission constraints, in order to use the three-way catalyst effectively. The optimum calibrations for the CVS (constant volume sampler) hot cycle require the same tendency as the Japanese 10-mode cycle, but the U.S. LA 4-mode fuel economy is affected not only by the calibration on the acceleration mode, but also by the calibration on the cruising mode. The implementation of the calculated optimum calibration on an actual vehicle showed good agreement with the computer studied values in emissions and fuel economy. When the torque fluctuation is taken into account as a driveability constraint, the optimum calibration changed toward richer A/F and less EGR rate calibration.

by K. Matsumoto; T. Inoue; K. Nakanishi; S. Matsushita; S. Koganemaru; H. Ooshika
Toyota Motor Co. Ltd.

Publ: HS-023 659 (SAE-SP-431), "Inter-Industry Emission Control Program 2 (IIEC-2). Progress Report No. 4,"
Warrendale, Pa., 1978 p21-37

Rept. No. SAE-780590; 1978; 8refs

Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978.

Availability: In HS-023 659

HS-023 663

THE EFFECTS OF ENGINE VARIABLES AND EXHAUST GAS RECIRCULATION ON EMISSIONS, AND FUEL ECONOMY--PT. 4

Steady-state engine mapping data were obtained from a 400 CID (cubic-inch displacement), V-8 spark ignition engine at compression ratios (CR) of 9.3 and 8.0. Data were obtained for seven steady-state speed-load conditions and also for one transient condition to determine the effect of CR on fuel consumption at various exhaust emission levels. These speed-load points were selected to represent engine operating points during the CVS-H (constant volume sampler-highway) cycle. (Earlier results at high speed-load conditions indicated that lower fuel consumption could be achieved with the 9.3 CR configuration, even when emission constraints for HC (hydrocarbon) and NOx (nitrogen oxides) were imposed. Also, at the low speed-load conditions, at high or unconstrained HC levels, fuel consumption was found to be lower at 9.3 CR; but HC emissions could not be reduced as far at 9.3 CR as at 8.0.) Finally, all of the speed-load points were combined in time-weighted cycle simulations to compare the two CR's by several emissions and fuel consumption criteria. At individual mapping points when engine emissions were not constrained, HC and NOx emissions generally increased and fuel consumption decreased as CR was increased from 8.0 to 9.3. When both HC and NOx emissions were constrained at the individual operating points by optimal adjustments of engine parameters, fuel consumption generally increased, and the fuel consumption advantage of 9.3 CR over 8.0 generally decreased as the emission constraints became more severe. When data from the individual mapping points were combined to simulate the CVS-H emission and highway fuel economy cycles, the calculated best fuel consumption values with unconstrained emissions were 4% lower at 9.3 CR than at 8.0 on the CVS-H cycle representing city driving. When HC and NOx emissions were constrained to the lowest level that could be achieved at both CR's (HC, 3.6 g/mi; NOx, 2.0 g/mi), fuel consumption again was lower at 9.3 by 7% on the CVS-H cycle. On the highway cycle under both conditions, there was no fuel con-

sumption difference between the two CR's. The lowest engine-out HC emissions obtainable were 1.4 g/mi at 8.0 CR and 3.6 g/mi at 9.3 CR (with NO_x at 2.0 g/mi). Under these conditions, fuel consumption was only 2% higher at 8.0 CR than at 9.3 CR. At either CR, it appears that exhaust after-treatment would be required to meet present or future standards with this engine.

by P. W. Kirklin; S. S. Wise

Mobil Res. and Devel. Corp.

Publ: HS-023 659 (SAE-SP-431), "Inter-Industry Emission Control Program 2 (IIEC-2). Progress Report No. 4,"

Warrendale, Pa., 1978 p39-49

Rept. No. SAE-780591; 1978; 9refs

Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978.

Availability: In HS-023 659

HS-023 664

UNREGULATED EMISSIONS FROM A PROCO [PROGRAMMED COMBUSTION] ENGINE POWERED VEHICLE

Unregulated emissions have been measured in a dilution tube from a 7.5-liter (460 CID (cubic-inch displacement)) PROCO-engine-powered vehicle operating at 50 kph on a chassis dynamometer. Emphasis was on particulate emissions, which were analyzed physically and chemically. A comparison is made to recent similar measurements on diesel and conventional gasoline engines. The Ford PROCO (programmed combustion) engine, a gasoline-fueled, stratified-charge, internal combustion engine, has been under development for a number of years. Its potential for meeting emission standards while obtaining good fuel economy has been reported. Measurements of unregulated emissions from early 4-cylinder PROCO-equipped vehicles were made by the Environmental Protection Agency (EPA), but the need existed for such an evaluation of a vehicle with a more recently designed V-8 engine. In this study, the sulfate emission rate from the PROCO was found to be negligibly low (less than 2 mg/km), and the hydrogen cyanide (HCN) and ammonia (NH₃) emissions were undetectable (less than 4.6 mg/km and less than 1.5 mg/km, respectively). Emission rates for the PROCO light-duty truck (with catalysts) compared with those for a diesel Oldsmobile Cutlass (without catalysts) and a gasoline-powered Oldsmobile Cutlass (with catalysts) are as follows: particulate (mg/km) - PROCO (6), Cutlass diesel (410), Cutlass gasoline (9); benzo(a)pyrene, BaP (microg/km) - PROCO (0.2), Cutlass diesel (3.0), Cutlass gasoline (0.2) (conservative); and aldehyde (mg/km) - PROCO (22), Cutlass diesel (32), Cutlass gasoline (9). In chemical and physical nature, the PROCO particulate matter more closely resembles that of a diesel than a conventional gasoline engine. The BaP emissions from the PROCO are lower than the diesel, due to the benefit of exhaust catalysts in the PROCO. The PROCO measurements were all made at steady speed, whereas those for the Cutlasses are the average over three driving cycles. Nevertheless, the conclusion is that no unregulated emissions of startling significance were found in the PROCO.

by D. E. McKee; F. C. Ferris; R. E. Goeboro

Ford Motor Co.

Publ: HS-023 659 (SAE-SP-431), "Inter-Industry Emission Control Program 2 (IIEC-2). Progress Report No. 4,"

Warrendale, Pa., 1978 p51-77

Rept. No. SAE-780592; 1978; 8refs

Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978. Funded by Inter-Industry Emission Control Prog.

Availability: In HS-023 659

HS-023 665

SINGLE-CYLINDER PROCO [PROGRAMMED COMBUSTION] ENGINE STUDIES--FUEL AND ENGINE CALIBRATION EFFECTS ON EMISSIONS, FUEL ECONOMY AND OCTANE NUMBER REQUIREMENTS

Engine-fuel relationships of the Ford PROCO stratified-charge engine have been examined in three phases to assess the inter-relationships among exhaust emissions, fuel economy, octane requirement, and fuel properties in an experimental, research, single-cylinder, stratified-charge PROCO (programmed combustion) engine. First, tests were conducted at a steady-state speed-load condition to determine the effect of engine calibration parameters on emissions and fuel economy, after an initial evaluation of engine operation with three different ignition system configurations (dual plug, high energy breakerless; single plug, high energy breakerless; single plug, transistor assisted, breaker type high energy). The dual ignition system produced reliable, misfire-free operation with the dilute mixtures and high exhaust gas recirculation (EGR) rates tested. Second, five fuels with significantly different volatility properties and composition were tested to determine their effect on emissions and fuel economy of the PROCO engine. Satisfactory operation was obtained at the steady-state speed-load condition at both 0% and 50% EGR with air-fuel ratios (A/F) as lean as 32:1. None of the fuels tested produced differences in emissions or fuel consumption which could be of practical use. In the final test phase, the Primary Reference Fuel (PRF) and Full Boiling Range Unleaded (FBRU) fuel octane requirements were determined for the single-cylinder PROCO engine at a series of 13 speed-load points which represent both the CVS-H (constant volume sampler-highway) cycle and certain other engine operating conditions. Subsequently, at six speed-load points where the PRF octane requirement was above 80, the effects of ignition timing, fuel-injection timing, intake mixture temperature, A/F, and EGR rates on FBRU octane requirement, exhaust emissions, fuel consumption, and power output were examined. The data show that the best selection of adjustable calibration parameters for controlling octane requirements depends on the mode of engine operation and the emission, fuel economy, and performance constraints associated with the mode of operation.

by B. J. Hillyer; W. R. Wade

Mobil Res. and Devel. Corp.; Ford Motor Co.

Publ: HS-023 659 (SAE-SP-431), "Inter-Industry Emission Control Program 2 (IIEC-2). Progress Report No. 4,"

Warrendale, Pa., 1978 p59-77

Rept. No. SAE-780593; 1978; 2refs

Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978.

Availability: In HS-023 659

HS-023 666

ORI OF TODAY'S VEHICLES--PT. 3 [OCTANE REQUIREMENT INCREASE]

In continued studies with full-scale engines on the laboratory dynamometer, the effect of the engine variables air-fuel ratio (A/F), ignition timing (SA, spark advance), and rate of exhaust gas recirculation (EGR) on octane requirement increase (ORI) and exhaust emissions was measured in two engines (a V-8 engine of 6.6 liters, or 400 CID (cubic-inch displacement) and a I-4 engine of 2.3 liters (140 CID)) at two compression ratios (CR 8.0:1 and 9.3:1). A lead-free base gasoline was used in all

tests, and a test procedure previously shown to relate well with road tests was followed. ORI in the V-8 engine was affected appreciably by SA and EGR, but was affected only slightly by A/F. ORI increased directly as EGR rate increased, whereas for each EGR rate, ORI was at a maximum at about 12 degrees retard from MBT (minimum spark for best torque). The effect of CR on ORI could not be determined directly from this analysis, but was estimated by averaging the ORI differences wherever tests were made at two CR's with the other engine variables being alike. For the V-8 engine, these "average" ORI's were as follows: 9.3:1 CR - FBRU (Full Boiling Range Unleaded) fuel 3.3, PRF (Primary Reference Fuel) 2.8; 8.0:1 CR - FBRU 5.3, PRF 4.3. ORI in the I-4 engine was affected by SA, EGR rate, and A/F. ORI increased as timing was advanced toward MBT, as A/F decreased toward stoichiometric, and as EGR was increased. The effect of CR on ORI in this engine could not be determined directly from this analysis, but again was estimated as it was for the V-8 engine. These "average" ORI's were as follows: 9.0:1 CR - FBRU 6.9, PRF 5.2; 8.0:1 CR - FBRU 5.7, PRF 4.7. Combustion chamber deposits from both engine tests were analyzed to determine the effects of engine variables on amounts and properties. The effects of deposits on ORI decreased as spark timing was retarded from MBT. Oil consumption had a greater effect on deposit properties than engine variables. On the basis of zinc content of deposits, the lowest oil consumption occurred during V-8 runs producing deposits with high carbon content and high C-H (carbon-hydrogen) ratios. On the same basis, the high oil consumption runs gave deposits with very low C content and low C-H ratios. Furthermore, at 9:1 CR, the smallest amounts of deposits (head or total) were formed under the coolest flame conditions.

by D. S. Gray; G. H. Meguerian; C. B. Tracy
Amoco Oil Co., Naperville, Ill.
Publ: HS-023 659 (SAE-SP-431), "Inter-Industry Emission Control Program 2 (IIEC-2). Progress Report No. 4," Warrendale, Pa., 1978 p93-106
Rept. No. SAE-780595; 1978; 4refs
Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978.
Availability: In HS-023 659

HS-023 667

THE INFLUENCE OF COOLING SYSTEM VARIABLES

A vehicle fleet test has been conducted to determine if octane advantages due to selected cooling system variables persist with stabilized deposits. The variables tested were reduced coolant temperatures, a direct substitution of aluminum (Al) for the iron cylinder head, and an Al head with Unique Cooling. Octane requirements, octane requirement increase (ORI), emissions and fuel economy results are presented and discussed. An engine dynamometer test program was conducted to investigate in greater detail some of the observations and test variables from the ORI fleet. The program was directed toward determination of the sensitivity of octane requirements to temperature of the coolant, oil, and intake mixture, each controlled independently; and a comparison of selected design features of the 2.3L and 5.0L engines regarding differences that distinguish the knocking cylinder. The fleet (8 vehicles with 2.3L engines, 14 vehicles with 5.0L engines) evaluation of reduced coolant temperatures to 66 degrees C showed a definite reduction of octane requirement for both engines tested, both with and without deposits. There was a

trend of reduced ORI in the 2.3L but little effect on ORI in the 5.0L. Reduced coolant temperature increased feed-gas HC (hydrocarbon) emissions on both engine families. These results are consistent with those reported by others, that engine octane requirement response to reduced coolant temperature is not the same in all engines. Utilization of this reduction in octane requirement depends upon the magnitude of feed-gas HC increase that can be tolerated. The use of Al as a cylinder head material, both with direct substitution and Unique Cooling designs, provided a small decrease in initial octane requirements. There was also a trend of reduced ORI at high mileage for the Al substitution cylinder heads. Feed-gas HC increased on all the Al head vehicles. The dynamometer test results show that coolant temperature was less effective over the range tested, and that the oil temperature had no effect. Engine variables influencing individual cylinder octane requirements were found to substantiate the knocking cylinder observed on the 2.3L but not the 5.0L. Further studies of individual cylinder operating conditions are necessary to fully describe the factors that determine cylinder octane requirements.

by D. J. Daly; R. D. Anderson; R. E. Baker
Ford Motor Co.

Publ: HS-023 659 (SAE-SP-431), "Inter-Industry Emission Control Program 2 (IIEC-2). Progress Report No. 4," Warrendale, Pa., 1978 p93-106
Rept. No. SAE-780595; 1978; 4refs
Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978.

Availability: In HS-023 659

HS-023 668

EVALUATION OF THREE-WAY CATALYSTS--PT. 3. FORMATION OF NH₃ [AMMONIA], ITS SUPPRESSION BY SO₂ [SULFUR DIOXIDE] AND RE-OXIDATION

In the third and final part of a series of laboratory evaluations of three-way catalysts (TWC's), the effect of inlet NO (nitric oxide) concentration and temperature on the NH₃ (ammonia) formation over fresh, pulsator-aged and dynamometer-aged TWC's of the current generation has been investigated under temperatures and exhaust compositions of practical interest. In spite of differences in aging procedures employed, both the pulsator- and dynamometer-aged catalysts show similar selectivity behavior. The effect of sulfur dioxide (SO₂) in feed-gas on gross NO conversion and NH₃ formation was studied over Pt-Rh (platinum-rhodium) and Pt-Rh-Ru (ruthenium) types of TWC's. A strong dependence of the gross NO conversion on the SO₂ concentration in exhaust gas mixtures was noted. A simultaneous suppression of gross NO conversion and NH₃ formation, in presence of SO₂ in feed-gas, is attributed to the poisoning of Pt sites on aged TWC's. IR (infrared) studies of SO₂ and carbon monoxide (CO) adsorption over Pt, Rh, and Ru metals suggest that differences in the surface affinity of these metals to SO₂ can be related to their observed activity patterns. Finally, reoxidation of NH₃ (formed over TWC's) on the vehicle-aged oxidation catalyst was studied as a function of catalyst temperature, excess oxygen (O₂), and inlet NH₃/NO ratio. The higher the NH₃/NO ratio, the better is the selectivity of NH₃ reoxidation to N₂ (nitrogen). For best net NO conversion in a system consisting of a TWC followed by an oxidation catalyst, it is advisable to have the first catalyst (TWC) operating at higher temperatures (greater than 550 degrees C, 1,020 degrees F) and the oxidation catalyst relatively cool (approximately 350 degrees C, 662 degrees F). The ox-

idation catalyst operating with excess O₂ at these temperatures would still be able to convert the remaining CO and the easily oxidizable hydrocarbons (HC). The oxidation of saturated HC under these conditions would not be expected since that requires fairly high temperatures (greater than 500 degrees C, 932 degrees F).

by H. S. Gandhi; H. C. Yao; H. K. Stepien; M. Shelef
Ford Motor Co.
Publ: HS-023 659 (SAE-SP-431), "Inter-Industry Emission Control Program 2 (IIEC-2). Progress Report No. 4," Warrendale, Pa., 1978 p107-18
Rept. No. SAE-780606; 1978; 30refs
Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978.
Availability: In HS-023 659

HS-023 669

EFFECT OF AIR-FUEL RATIO MODULATION ON CONVERSION EFFICIENCY OF THREE-WAY CATALYSTS

Studies were conducted, based on the premise that major reasons for an increase in the selectivity windows of a three-way catalyst (TWC) when the engine air-fuel ratio (A/F) is sinusoidally modulated could be retention of adsorbed species on the catalyst surfaces, followed by reactions with gas-phase reactants. The studies included calculation of carbon monoxide (CO), hydrocarbon (HC), and nitrogen oxides (NO_x) conversion efficiencies under A/F modulation, assuming no chemical adsorption; laboratory and engine dynamometer tests to clarify the retention characteristics of oxygen (O₂), nitric oxide (NO), and HC on the catalyst; and comparison of the experimental efficiencies determined under A/F modulation with efficiencies obtained by computer simulation based on a model including chemical adsorption and reaction processes. The widening of the selectivity windows of a TWC under A/F modulation was shown to result from retention of adsorbed species on catalyst surfaces and their subsequent reaction with gas-phase reactants; calculated and experimental results were in good agreement. O₂, NO_x, and HC are retained on the TWC surface, but CO is not. O₂ and NO_x are retained more easily than HC. The retained species react with other incoming species when the inlet gas composition is changed. Retention capacity of 0.8 liter of the tested catalyst was approximately 14,000 ppm.sec; retention capacity, however, depends on catalyst volume, space velocity, catalytic metal loading, and catalytic metal ratio.

by Y. Kaneko; H. Kobayashi; R. Komagome; O. Hirako; O. Nakayama
Mitsubishi Motors Corp.
Publ: HS-023 659 (SAE-SP-431), "Inter-Industry Emission Control Program 2 (IIEC-2). Progress Report No. 4," Warrendale, Pa., 1978 p119-27
Rept. No. SAE-780607; 1978; 8refs
Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978.
Availability: In HS-023 659

HS-023 670

50,000 MILE VEHICLE ROAD TEST OF THREE-WAY AND NO_x REDUCTION CATALYST SYSTEMS

The performance of three-way and nitrogen oxides (NO_x) catalysts was evaluated on vehicles utilizing non-feedback fuel

control and electronic feedback fuel control. The vehicles accumulated 80,450 km (50,000 mi) using fuels representing the extremes in hydrogen-carbon ratio (H/C) available for commercial use. Feedback carburetion compared to non-feedback carburetion improved highway fuel economy by about 0.4 km/l (1 mpg) and reduced deterioration of NO_x emissions with mileage accumulation. NO_x emissions were higher with the low H/C fuel in the three-way catalyst system; feedback reduced the fuel effect on NO_x in these cars by improving conversion efficiency with the low H/C fuel. Feedback had no measurable effect on hydrocarbon (HC) and carbon monoxide (CO) catalyst efficiency. HC emissions were lower with the low H/C fuel in all cars. Unleaded gasoline octane improver, MMT (methylcyclopentadienyl manganese tricarbonyl), at 0.015 g Mn (manganese)/l (0.06 g/gal) increased tailpipe HC emissions by 0.05 g/km (0.08 g/mi). Little loss was noted in HC and CO conversion efficiencies in the three way catalyst (TWC) systems after 50,000 mi, but there was a significant loss in the non-feedback NO_x catalyst systems due to overheating caused by overrich operation. Both catalysts retained substantial ability to convert NO_x at the end of mileage accumulation. Test results of fuels with significantly lower lead levels suggest that TWC catalysts with high rhodium and high precious metal loading are insensitive to phosphorus from oil but very sensitive to lead poisoning.

by W. T. Wotring; G. H. Meguerian; H. S. Gandhi; F. D. McCuiston; A. G. Piken
Standard Oil Co. (Ohio); Amoco Oil Co.; Ford Motor Co.
Publ: HS-023 659 (SAE-SP-431), "Inter-Industry Emission Control Program 2 (IIEC-2). Progress Report No. 4," Warrendale, Pa., 1978 p129-50
Rept. No. SAE-780608; 1978; 15refs
Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978.
Availability: In HS-023 659

HS-023 671

ATYPICAL FUEL VOLATILITY EFFECTS ON DRIVEABILITY, EMISSIONS, AND FUEL ECONOMY OF STRATIFIED CHARGE AND CONVENTIONALLY POWERED VEHICLES

The effects of fuels having atypical distillation characteristics were studied on the driveability, fuel economy, and emissions of vehicles equipped with a variety of powerplants, including conventional, stratified-charge, port-fuel-injected, and lean-burn engines. The atypical distillation fuels reflect the effect of removing varying amounts of mid-range or front-end blending components from a typical commercial gasoline. An index system was developed which allows a comparison of fuel effects across a fleet of vehicles differing substantially in terms of driveability, fuel economy, and emissions. Using this index system, the fleet average results show that emissions and fuel economy, as well as driveability, are depreciated with the extreme atypical fuels and that improved driveability can result in improved emissions and fuel economy. The less atypical fuels gave essentially equivalent driveability to that of the reference fuel. Better driveability is generally shown using the Front-Cut fuels rather than the Mid-Cut fuels. A fuel-injected, three-way catalyst vehicle was the most tolerant of the changes in fuel distillation characteristics, while a lean-burn vehicle was the least tolerant. The driveability results also indicate that the historical use of 10%, 50%, and 90% distillation temperatures may not be sufficient to describe fuel volatility as it relates to driveability. Although the test fleet exhibited a wide range of driveabilities, occurrence of malfunctions

HS-023 672

HSL 79-02

tended to increase in proportion to depreciation of driveability. Fleet fuel economy measured by 1975 Federal Test Procedures was shown to increase with improving driveability.

by J. H. Baudino; L. C. Copeland
Atlantic Richfield Co., Harvey Technical Center
Publ: HS-023 659 (SAE-SP-431), "Inter-Industry Emission Control Program 2 (IIEC-2). Progress Report No. 4," Warrendale, Pa., 1978 p151-62
Rept. No. SAE-780610; 1978; 5refs
Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978.
Availability: In HS-023 659

HS-023 672

FUEL VOLATILITY EFFECTS ON DRIVEABILITY OF VEHICLES EQUIPPED WITH CURRENT AND ADVANCED FUEL MANAGEMENT SYSTEMS

Fuel volatility and cold/hot engine driveability relationships were evaluated in six 1976/1977 model cars representing conventional carburetor and advanced-type fuel metering systems, in order to provide guidance for engine modifications to take advantage of fuel benefits or to overcome performance deficiencies. There were large variations among cars in the maximum volatility tolerance relative to vapor lock during summer and hot engine operation, with a fuel-injected carburetor and a new design carburetor system tolerating gasoline volatility levels in excess of normal maximum summer levels. Similarly, cold engine start and driveaway performance at low and intermediate ambient conditions varied widely. Fuel-injected cars showed the best performance and least sensitivity to gasoline volatility changes. Performance differences among all cars with a specific fuel were significantly greater than differences resulting from typical variations of fuel volatility for individual cars. This shows that fuel systems can be designed to provide good overall driveability performance and low sensitivity to fuel volatility differences, permitting greater flexibility to produce unleaded gasoline.

by C. R. Morgan; C. N. Smith
Mobil Res. and Devel. Corp.
Publ: HS-023 659 (SAE-SP-431), "Inter-Industry Emission Control Program 2 (IIEC-2). Progress Report No. 4," Warrendale, Pa., 1978 p163-71
Rept. No. SAE-780611; 1978; 5refs
Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978.
Availability: In HS-023 659

HS-023 673

THE INFLUENCE OF FUEL CHARACTERISTICS ON VAPORIZATION IN THE S.I. [SPARK IGNITION] ENGINE CYLINDER DURING CRANKING AT LOW TEMPERATURE

Using five single-component, three dual-component, and five full boiling range fuels, the relationship between engine startability under low temperature and fuel volatility was studied through the analysis of fuel vaporization and mixture formation in the cylinder. The effect of other factors such as cranking speed, ignition timing, and fuel quantity supplied to the cylinder, on startability was also examined from the viewpoint of fuel vaporization in the cylinder. A theoretical approach for estimating the startability with fuels of various volatility was attempted. Based on this estimation, the degree of cold starta-

bility deterioration with lower volatility fuels and the way to improve cold engine startability are discussed. In general, the following factors were found effective in improving engine startability under cold temperature: higher cranking speed; closer ignition timing to TDC (top dead center); fuels of higher volatility, i.e. 10% distilled temperature is below 50 degrees C and RVP (Reid vapor pressure) is over 0.5 kg/sq cm; and richer air-fuel ratio (A/F) (2.5 to 1) until first fire. With lower volatility fuel which is expected to be predominant in the future, a precise fuel metering corresponding to the fuel characteristics and longer cranking duration is required. A/F setting after first fire and first run should also be optimized to keep the engine running. In order to predict the effect of fuel volatility change on startability, a theoretical approach for estimation of startability is proposed. Using this method, predicted cranking duration till first fire showed a fairly good coincidence with experimental results with single component fuels.

by Y. Nakajima; T. Saito; Y. Takagi; K. Katoh; T. Iijima
Nissan Motor Co., Ltd., Yokosuka, Japan
Publ: HS-023 659 (SAE-SP-431), "Inter-Industry Emission Control Program 2 (IIEC-2). Progress Report No. 4," Warrendale, Pa., 1978 p173-89
Rept. No. SAE-780612; 1978; 6refs
Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978.
Availability: In HS-023 659

HS-023 674

ALCOHOL INVOLVEMENT IN MICHIGAN FATAL ACCIDENTS: 1968-1976. INTERIM REPORT

Nine years of Michigan fatal accident data (1968-1976) were analyzed to assess the impact of lowering the minimum legal drinking age in Michigan from 21 to 18 on 1 Jan 1972. Driver age, sex, and the presence or absence of drinking were the key variables, and partitioning of the chi-square statistic into its degrees of freedom was the primary analytic technique. It was found that a peak occurs in the age-specific, had-been-drinking (HBD) rate about one year after drinking becomes legal for a particular age group. This peak shifted from age 22 to age 19 when the drinking age was lowered and resulted in an average (by year) increase of 53% in the HBD rate for 18-to-20-year-old drivers with some increase in the 17-year-old driver's HBD rate. The increased HBD rate of young drivers also caused an overall increase in the HBD rate of all drivers even though the HBD rate of older drivers remained unchanged or even decreased. Female drivers were found to represent only a small proportion, 2.5%, of drinking drivers during the nine-year period, but this proportion had increased to 4% in 1975-1976. The HBD rate of 18-to-20-year-old female drivers increased from 8.4% to 18.6% after the drinking age was lowered.

by J. D. Flora; L. D. Filkins; C. P. Compton
University of Michigan, Hwy. Safety Res. Inst., Ann Arbor, Mich. 48109
MAL-77-001A
Rept. No. UM-HSRI-78-16; 1978; 79p 6refs
Rept. for Oct 1977-Mar 1978.
Availability: Corporate author

February 28, 1979

HS-023 678

HS-023 675

TRAFFIC ON UTAH HIGHWAYS, 1977

The data presented represent the average daily traffic volumes on road sections of varying lengths in four categories: State Highways, Federal-aid Urban Local Highways, Federal-aid Secondary Local Highways, and Federal-aid Primary Highways not on the state system. Instructions, a list of abbreviations, county code numbers and a cross reference guide for city streets in the Salt Lake, Provo and Ogden areas are provided. A 1977 Manual Classification Summary (by vehicle type) on state roads, Federal-aid urban, Federal-aid secondary, and local roads is included, in addition to a list of permanent counting station locations. A tabulation "Automatic Recorder Data by Months" for 1977 contains traffic data from all permanently located traffic machines, on average traffic by day of week for each month, average weekday traffic by months, average day of week traffic by months, percent the average day is of the average weekday, percent the monthly daily average is of the yearly daily average, and percentage breakdown by vehicle types for the yearly average. Three foldout traffic volume maps are included.

Utah Dept. of Transportation, Travel Analysis Unit
1978; 237p
Prepared in cooperation with Federal Hwy. Administration.
Availability: Corporate author \$10.00

HS-023 676

FUEL INJECTION FOR THE MASSES

The Edelbrock Electronic Fuel Injection (EFI) System is discussed. Several years ago Edelbrock Corp. began development of this system on the premise that timed injection based on induction system flow that is essentially dry is beneficial. It was felt that this type of system stood to reduce fuel losses due to air/fuel separation inside the induction system, to provide more uniform air/fuel mixture ratios and densities, and to introduce a legitimate lean-burn combustion condition without the problems of erratic engine performance (lean misfire, lost power). The EFI system can be installed by a car owner; the main components of the kit (which includes comprehensive instructional materials) are as follows: preassembled manifold with injector nozzles and fuel rail, preadjusted breakerless distributor, ignition amplifier, fuel pump safety switch, fuel filter, electronic control box, fuel pump, fuel pressure regulator, and gaskets. A number of other pieces are included in the kit, including hoses and hardware necessary for any installation. The key to the success of this sequential system is the control box. It reacts to changes in milliseconds and must be mounted inside, where it can be kept free from dirt and moisture. It can be mounted under the dash or on the transmission tunnel. Installed, the fuel injection system is designed to use stock air cleaner and to hook up with all necessary emissions devices. Some baseline and EFI system data were collected with respect to steady-state mileage, 0-60 mph acceleration, and overall fuel economy as measured on Motor Trend's 73-mile loop. A 1976 400 CID (cubic-inch displacement) Chevrolet K5 Blazer with stock gearing and exhaust was utilized. Following installation of the EFI system, 12.1 seconds for 0-60 was recorded vs. a stone-stock 14.2 seconds. Steady-state mileage on a chassis dynamometer averaged 10.9 mpg for the stock vehicle compared to 13.52 mpg with the EFI system. Stock

fuel economy was measured to be 9.9 mpg over the 73-mile loop vs. 11.98 mpg for the EFI vehicle.

Publ: Motor Trend v30 n8 p91-2, 94 (Aug 1978)
1978

Availability: See publication

HS-023 677

A CONVERSATION WITH JOAN CLAYBROOK [FEDERAL SAFETY STANDARDS]

In a question-and-answer format, the Administrator of the National Hwy. Traffic Safety Administration (NHTSA) responds to questions critical of strict new standards for auto safety and fuel economy. Discussion concerns the following areas: reliability of traffic accident data; consistency in setting priorities; coordination of safety standards with design changes; airbag availability; cost of safety items; trade-offs among safety, fuel economy, and emission standards; government regulations' effect on price of consumer goods and contribution to inflation and production; practicality of crash survivability and fuel economy standards; 1984-1985 mpg standards; confidentiality of industry data; seatbelt and airbag protection in various types of crashes; and government vs. industry in control of the future of the automobile.

Publ: Motor Trend v30 n8 p102-7 (Aug 1978)
1978

Availability: See publication

HS-023 678

DRIVERS' EYE MOVEMENTS AS RELATED TO ATTENTION IN SIMULATED TRAFFIC FLOW CONDITIONS

Drivers' eye-movement amplitude and fixation duration were studied in four simulated traffic flow conditions (within free-flow mode (A), under maximum flow conditions (B), within congested-flow mode (C), and on an urban street between signalized intersections (D)). Such data are likely to have their most important application regarding the essential information stored by the driver. A correlation was found between eye-movement data and various traffic flow conditions. As driving "stress" increases (for increasing flow conditions and for driving between signalized intersections), eye-movement distances become shorter while fixation duration becomes longer. From the comparison of the four traffic flow conditions, it appears that conditions A and C can be grouped together against conditions B and D. While the first group can be associated with, for example, normal drivers' attention, the second group can be associated with situations of relatively high attentional demand. Although conditions A and C can be grouped together, statistically there is a significant difference between the two conditions, where drivers (rated subjectively and on the average) pay more attention to the road in condition C than in condition A. The results of the experiment make it possible to suggest an interpretation for the discontinuity phenomenon in the flow-concentration relationships under peak flow conditions. The drivers' transient attention from the normal attention situation (at the free-flow mode) to "overload" attention (under peak flow conditions) and the return to normal attention (at congested mode) can account for the discontinuity phenomenon. The use of eye-movement amplitude (angular distance) as a tool to determine attention level during driving appears to be satisfactory for the purposes of this research.

However, more reliable measurements must be used for purposes requiring more accurate definitions. Since information processing in driving is highly subjective, the advantages of the uncertainty model could be derived only by looking at the model from a general point of view rather than from a concern with its adjusted parameter values.

by Avishai Ceder
 Publ: Human Factors v19 n6 p571-81 (Dec 1977)
 1977; 13refs
 Availability: See publication

HS-023 679

FUEL ECONOMY AND EXHAUST EMISSIONS UNDER TWO CONDITIONS OF TRAFFIC SMOOTHNESS

The potential fuel economy and exhaust emission benefits that might be obtained by smoothing the flow of traffic have been investigated. It was determined that substantial improvements in fuel economy and reductions in exhaust emissions are possible if the flow of traffic is smoothed. Traveling during the smooth flow conditions of the early morning (4:00 A.M.) as compared to travel on the same urban route during highly congested flow (5:00 P.M. rush hour), resulted in a fuel economy improvement of 31% for hot starts and 35% for cold starts. Also, traveling during smooth flow conditions resulted in reductions in hydrocarbon, carbon monoxide, and nitrogen oxides emission levels of 54%, 52%, and 2%, respectively, for hot starts, and 35%, 52% and 13%, respectively, for cold starts. The results were obtained by simulating traffic conditions on a chassis dynamometer. Traffic might be smoothed to obtain such benefits in many ways, including turning lanes, dynamic traffic signal control, exclusive lanes, right turn on red, as well as staggered work hours, carpooling, and effective snow removal.

by Robert Herman; Ronald G. Rule; Marvin W. Jackson
 General Motors Corp., Res. Lab.
 Rept. No. SAE-780614; 1978; 8p 3refs
 Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun
 1978. Technical Paper Series.
 Availability: SAE

HS-023 680

THE MOPED AND THE TRAFFIC MIX

The safety problems of the moped are expected to cluster around the following four elements: low power, lack of conspicuity, operator inexperience, and brake lever location. The low power of the moped means that the machine is unable to accelerate with normal traffic and unable to keep up with the normal traffic flow except on residential streets or in congested downtown traffic. The mopedalist who operates in a traffic stream where he/she cannot keep up is going to put himself/herself in danger, and is going to tempt other vehicle drivers to take chances. Consequently, in many situations the moped is going to have to be driven as if it were a bicycle, and the mopedalist will have to face all the problems regularly faced by the bicyclist (e.g. pedestrians stepping off curb, cars turning right, conflict with the bicycle, sudden opening of parked car doors). Casting a lower silhouette than a bicycle or a motorcycle, the moped is among the least conspicuous elements in the traffic flow. A motorist's view of a moped in the far right of the curb can be blocked by a door pillar, pas-

senger, or another vehicle. When driving as a motorcyclist in the left third of the lane, the mopedalist can easily be hidden from the view of the motorist following the car following him/her. Another aspect of conspicuity is perception. The moped, as the newest element in the traffic pattern, is probably the last to be perceived by the motorists and also may be misidentified as a motorcycle. The mopedalist should, therefore, stay out of situations where safety may depend upon conspicuity or ability to accelerate quickly (e.g. avoid left turns, especially when having to wait for oncoming traffic to clear; avoid trying to beat oncoming traffic when entering traffic stream). Learning to operate a moped is easy; learning to drive one safely is quite another matter. The matter of youthful inexperience is probably going to be the biggest problem. Present state laws permit 16-year-olds and even younger persons to move directly into the traffic stream with no training, no special license, no experience, and no protective helmet. The brake controls on a moped may be a problem because their location (front brake lever on right handlebar and vice versa) is just the opposite of that of a typical 10-speed bike which may result in application of the wrong brake, and which makes turning/signaling maneuvers dangerous.

by Kenneth F. Licht
 Publ: Traffic Safety v78 n7 p8-9, 28-9 (Jul 1978)
 1978; 1ref
 Availability: See publication

HS-023 681

BI-LEVEL REPORTING OF ACCIDENTS

Bi-level accident reporting is recommended, since with bi-level reports, there is first a basic report form which is designed to meet all legal, administrative, and insurance requirements and to gather the data for the overall picture; then there is the supplementary or bi-level report form which is intended to obtain the necessary information about a specific accident problem (as revealed by the basic form) to formulate a countermeasure. A bi-level reporting system, when properly implemented, is more reliable and no more expensive than typical systems in use today. The continuity of reporting necessary to gauge trends in accident rates is provided by the basic form, and a great amount of flexibility in the reporting system is provided by the supplementary form. The following eight steps should be followed in implementing a bi-level report form: select a priority area; narrow the scope, concentrating on causal sequences; use experts to formulate 10 to 12 lucid, probing questions; test, review, and revise the form; monitor the responses for quality; analyze the responses for countermeasures; implement the countermeasures; and periodically use the bi-level to evaluate the countermeasures.

by Alan F. Hoskin
 Publ: Traffic Safety v78 n7 p18-20, 28 (Jul 1978)
 1978
 Availability: See publication

HS-023 682

FEDERAL RESEARCH, DEVELOPMENT AND DEMONSTRATION PROGRAMS IN SURFACE TRANSPORTATION NOISE

A compilation is presented of the research, development, and demonstration activities (R D and D) of Federal agencies and departments in the area of surface transportation noise from

fiscal year 1975 through 1978, including assessments of these activities and recommendations for future areas of work. Represented are the Dept. of Transportation (DOT), the Environmental Protection Agency (EPA), Dept. of Defense, Dept. of Agriculture, Dept. of Justice (DOJ), Dept. of Housing and Urban Development (HUD), Dept. of Energy (DOE), and the Dept. of Commerce. The three most active participants in terms of funding surface transportation noise R D and D are DOT, EPA, and the Department of the Army, with DOT's effort significantly larger than that of other Federal departments and agencies. DOT's considerable expenditures are in the areas of highway vehicles, rail, surface vehicle components, and measurement and enforcement (specifically on medium and heavy trucks and truck components such as mufflers, tires and engines; on guided mass transit systems such as urban rail rapid transit; on railroad systems, and on highway noise prediction, measurement and mitigation). EPA's activities are conducted principally to support the regulatory process, but are also to advance the state-of-the-art of noise control technology. Demonstration programs have involved noise mitigation methods for highway and transit malls. The Defense Department's programs principally support their combat and tactical support and training mission requirements, but also support community, environmental, and occupational protection needs (to increase survivability through reduced detection in combat, to improve speech communication, to protect the hearing of military personnel, and to reduce the environmental impact of peace-time military operations on civilians). The U.S. Forest Service of the Department of Agriculture is concerned with the effect of recreational vehicle noise on the environment. The DOJ's one activity was in the area of warning signals for emergency vehicles. HUD's efforts are associated with developing techniques for compatible land use and building construction practices to attenuate urban noise. DOE's program is ancillary to their primary mission of energy research and development. The National Bureau of Standards of the Commerce Dept. supports other Federal programs, principally in the development of measurement methodologies and measuring equipment. Many of the efforts undertaken were cooperative efforts involving one or more agencies. The nine appendices include agency funding totals and an index to the projects, funding details on the seven departmental R D and D programs, and on surface transportation noise regulatory programs.

Federal Interagency Surface Transportation Noise Res. Panel
Rept. No. EPA-550/9-78-305; 1978; 190p refs
Availability: Environmental Protection Agency, Office of
Noise Abatement and Control, Washington, D.C. 20460

HS-023 683

A METRIC ENGINE DEVELOPMENT EXPERIENCE

A description is presented of the metric development of a V-8 engine at the John Deere Waterloo (Iowa) Tractor Works, a pilot project in response to a corporate directive in 1973 for full conversion to spark ignition units. Each John Deere and Co. factory in North America established a pilot project which would involve adoption of the new measurement system and expose all areas of the operation to the need for bilingual capability. The Waterloo Tractor Works project involves one of their all new experimental programs, a turbocharged V-8 diesel engine. The Waterloo activity is the company's largest product development and manufacturing operation and involves design, development, and manufacture at Waterloo of most of the total product. With this metric development pilot

project, the engine design originated at Waterloo; and the patterns, castings, and other experimental parts were produced in-house. Development, tooling, and additional factory resources were accomplished locally, thereby exposing all areas to the project. Furthermore, since the business systems, manufacturing, and marketing data base is coupled to corporate headquarters, the program interfaces with all Deere and Co. operations.

by Harold L. Brock

John Deere Waterloo Tractor Works, Waterloo, Iowa

Rept. No. SAE-770360; 1977; 8p

Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.

Availability: SAE

HS-023 685

ROADCRAFT. THE POLICE DRIVERS' MANUAL. 1977 ED.

Information on safe driving practices and procedures prepared by British police officers is provided in the following chapters: the system of car control; acceleration, gear changing, braking, and steering; drivers' signals; road observation; positioning; cornering; overtaking; skidding; speed and safety; and general advice and Ten Commandments. The Ten Commandments of Motoring end with the injunction "Drive according to the Highway Code and you will drive safely."

Home Office, London, England

1977; 100p

Availability: Pendragon House, 2959 E. Bayshore Rd., Palo Alto, Calif. 94303

HS-023 686

PERFORMANCE AND EMISSION PREDICTIONS FOR A MULTI-CYLINDER SPARK IGNITION ENGINE WITH CATALYTIC CONVERTER

A mathematical model is developed to represent an oxidizing catalytic converter in the exhaust system of a spark ignition engine in which the flow is nonsteady. By using the basic mass transfer, heat transfer, and chemical reaction rate equations on the path lines, the heat generated at the catalyst surface and the friction factor are allowed for in the generalized nonsteady flow relations using the method of characteristics. The model is included in a multicylinder engine simulation program. Secondary air injection into the exhaust system is represented by a simple mixing process without chemical reaction. A series of tests were carried out on a four-cylinder, two-liter engine with a carbon monoxide (CO) and hydrocarbon (HC) oxidizing converter and secondary air injection. Comparison of results between experiments and computer calculations shows excellent agreement when the converter is new. A deterioration in HC prediction occurs if the catalyst surface is poisoned or aged; the CO predictions, however, remain fairly good. The tests showed that the CO levels entering the exhaust pipe are dependent on the engine condition. Prediction of the overall engine and emission levels is very good. The comprehensive

simulation program offers an excellent tool for examining practical locations of catalytic converters.

by P. C. Baruah; R. S. Benson; H. N. Gupta
University of Manchester, Inst. of Science and Technology,
Manchester, Lancs., England
SRC-B/RG/3876

Rept. No. SAE-780672; 1978; 24p 21refs
Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun
1978. Technical Paper Series.
Availability: SAE

HS-023 687

THE HOW AND WHY OF ENERGY EFFICIENT DRIVING

An Energy Efficient Driving program, developed by Doron Precision Systems, Inc. in cooperation with the Highway Users Federation and with one of the nation's leading driver education curriculum developers integrates fuel conservation techniques with safety concepts and is perfectly compatible with simulator programs already in use in public schools across the U.S. using safety education classroom simulators and related software. It was decided that the most practical approach to the development of this program would be to start with learning drivers in an initial phase and later to develop supplementary programs for individuals with long-established driving habits that would have to be corrected and changed in order to effect fuel savings. The Energy Efficient Driving program comprises filmstrip presentations, cassette narrations, driver's guides, discussion guides, instructor's manual, and specially designed learning activities for the simulator and behind-the-wheel reinforcement. The multiphase program outlines more than 40 fuel-saving principles and techniques for increasing motor vehicle fuel economy; these include such driving practices as proper start-up, acceleration, and braking, as well as principles of automobile maintenance and use, and how to plan ahead to save gasoline. The research involved in developing the program proved beyond question that driving habits may be the most important single element in improving fuel economy. The ultimate purpose of the program is to reduce the waste of motor fuel through proper driving and maintenance decisions and practices learned through Energy Efficient Driving. The enthusiasm with which the program has been accepted and sought by many school systems on a statewide basis since its introduction in 1977 has strengthened the conviction that the time for such a program is definitely here. Development of the program in future phases will be aimed at the creation and offering of special training programs to retrain drivers to employ energy-efficient driving techniques; these courses would be in seminar and short-course format for business, industrial, and fleet use.

by Oral Evans
Publ: Journal of Traffic Safety Education v25 n4 p7-8 (Jul 1978)
1978; 1ref
Availability: See publication

HS-023 688

DRIVER EDUCATION--THIRTY YEARS OF PROGRESS WITH PROBLEMS

Shortcomings in the development of high school driver education programs in the U.S. during the past 30 years are discussed. In many states, during the early years, a tacit deci-

sion was that quantity of driver education should be accepted as a priority goal. The line of reasoning was that quality of instruction would or could be achieved, gradually, after the course became an integral component of the secondary school curriculum. To this end, driver education enthusiasts banded together to lobby for special legislation designed to expand public high school driver education. As a result, today no states with special driver education legislation have certification requirements for teachers of driver education on a par with teachers of other subjects. Several states now authorize use of paraprofessionals in unsupervised laboratory instruction. A few states, with the number expanding, encourage school districts to contract with non-school agencies for part or all instruction in driver education. The driver education profession, in its eagerness to fill an educational need made a serious mistake in pushing for quantitative expansion through legislation which provided for special funding and, in effect, mandated the subject as a curricular offering. Although some persons may be able to justify such legislation if emphasis is accompanied by maintenance of high-level program standards which assure instructional effectiveness, this has not happened and is not likely to occur. Enactment of the special legislation in itself did not do the primary damage. The real error by leaders in the profession was to make the hidden decision not to require that quantitative expansion be accompanied by qualitative improvement. Today the profession should permit program expansion only where there is assurance that high standards of quality will be maintained or will be enhanced. These standards, which should emanate from state board of education regulations, should cover requirements for program features such as supervision and evaluation, time allocation, facilities and equipment, curriculum content, and teaching methods and materials.

by Thomas A. Seals

Publ: Journal of Traffic Safety Education v25 n4 p9-11 (Jul 1978)
1978

Excerpts from a presentation at Annual Conference of Maryland Driver and Traffic Education Assoc., 14 Oct 1977.
Availability: See publication

HS-023 689

THE IIHS [INSURANCE INSTITUTE FOR HIGHWAY SAFETY] STUDY ON DRIVER EDUCATION: FACT OR FICTION?

The conclusion of an Oct 1977 study by the Insurance Inst. for Hwy. Safety (IIHS) that at least 2000 fatal automobile crashes per year were the result of the existence of high school driver training, is shown to be unsupportable based on the research design and statistical analyses used in the study. The study argued that the net effect of driver training is to increase fatal accidents because the effect is a necessary consequence of the conclusions that there are an increased number of teenage drivers produced by driver training programs each year, and that driver training has no apparent impact on fatal accident involvement. The IIHS's conclusions were based on a retrospective correlational analysis of data from 27 states and an alleged similarity between its correlational findings and an experimental study on driver training conducted by the Univ. of Salford in England. IIHS collected data on a number of variables, including the following: each state's fatal accident rate for drivers aged 16 to 17 and 18 to 19, the percentage of each state's 16-to-17-year-olds and 18-to-19-year-olds receiving driver training, the percentage of each state's 16-to-17-year-

olds and 18-to-19-year-olds who are licensed without driver training, the percentage of each state's licensed 18-to-19-year-olds who were licensed at 16 or 17, and whether the state required driver training as a prerequisite for licensure prior to 18 years of age. The amount of precipitation, rural mileage, and year were included as control variables in certain analyses. Two sets of analyses were done, one set on fatal accident rates, the other on licensing rate. In essence, the study attempted to measure the cause-and-effect impact that driver training had on teenage accident fatalities and on the number of teenagers licensed prior to 18 through a multiple correlational analysis of historical data. All of the relationships were based on a sample of 27 observations since the observational units of the study were states rather than individual drivers. What this type of study measures, for example, is whether states with high values on one variable tend to have low or high values on some other variable. If such relationships are found, the variables are said to be correlated. However, the existence or nonexistence of simple or partial correlation does not necessarily prove the existence of causal relationship among variables studied.

by Raymond C. Peck
Publ: Journal of Traffic Safety Education v25 n4 p14-6 (Jul 1978)

Prepared for presentation at 26th Annual Conference of California Assoc. for Safety Education, Long Beach, 30 Apr 1978.

Availability: See publication

HS-023 690

YOUNG PEDESTRIAN ACCIDENTS AND HOW TO PREVENT THEM

Epidemiological, causal, and preventive aspects of traffic accidents involving young pedestrians are outlined. Children under the age of 15 make up over 40% of all pedestrian accidents, this age group representing about 27% of the U.S. population. The 5-to-9-year-old age group is involved in about 20% of the pedestrian accidents, while comprising about 9% of the population at risk. Some general descriptors for characterizing young pedestrian accidents include the following: occurrence within a block of home during daylight hours; weekday, residential area, midblock, car going straight, driver's vision blocked by parked car, pedestrian running; and play, rather than travel, child's reason for being in the street. The accident descriptors lead to several accident stereotypes, including densely populated residential areas, reduced parental supervision, parked cars, and solitary young pedestrians running. The young pedestrian is at fault in almost all young pedestrian accidents. A child's proclivity for such accidents is related to the following: limitations in a child's perspective and ability to size up a traffic situation because of diminutive stature, a child's incapability of distribution attention, a child's difficulty in discriminating direction of sound, and a child's belief that the safest way to cross a street is to run. Researchers in Sweden suggest that the average child does not obtain the requisite degree of maturity as a pedestrian until between 9 and 10 years of age. Some measures to prevent young pedestrian accidents include the following: separate vehicles and pedestrians physically (e.g. residential street closure); increase accident-avoidance time by reducing the length of time required from initial perception through reaction time (e.g. eliminating parked cars or utilizing diagonal parking, providing street lighting and retroreflective materials for

clothing worn by pedestrians at night); and education and training programs for both drivers and young pedestrians.

by Martin L. Reiss
Publ: Journal of Traffic Safety Education v25 n4 p17-8, 26 (Jul 1978)
1978; 12refs
Availability: See publication

HS-023 691

WHERE IS TRAFFIC SAFETY EDUCATION HEADING?

The U.S. lacks a proven, comprehensive, nationally acceptable traffic safety education program; but educators, private industry, and the Federal government are trying to sort out the situation. For example, the National Hwy. Traffic Safety Administration (NHTSA) is sponsoring four pilot projects designed to determine which traffic safety skills are most important and how best to teach them. Unfortunately, final evaluation of the projects is not expected until 1981; in the interim, Americans must make do with the present patchwork of traffic safety education. According to NHTSA's 1975 Driver Education Evaluation Prog. (DEEP) Study, "quality" high school driver education programs are capable of reducing crash involvements by 10% to 15% among those who take the courses. To achieve this potential, governmental and private educators are following the DEEP recommendation to evaluate existing driver education programs in terms of effectiveness rather than the number of students taking the courses. During the past decade, a meteoric rise in the popularity of motorcycles and, more recently, mopeds, has created demand for specialized driver training not provided by traditional high school courses. In Dec 1976, the Motorcycle Safety Foundation produced the Motorcycle Rider Course, an extensive program requiring a minimum of 23 hours training on a driving range. Military bases, police departments, motorcycle clubs, safety organizations, and more than 300 schools taught the course to more than 33,000 people in the first full year it was offered. To assure that the course will be taught in a uniformly competent manner, the Foundation has developed a detailed instructor preparation course. The Moped Association of America has a long-range plan to develop a safety education course, and the National Safety Council is developing a two-hour moped safety training program. But no organization has announced plans for a nationally uniform and comprehensive moped safety curriculum. Bicycle, pedestrian, and rider safety education, aimed predominantly at elementary and junior high school students, has long been the stepchild of traffic safety programming. The 1966 Highway Safety Act mandated state driver education programs, certification of school and commercial instructors, and research of effective training techniques, among its many provisions; it is felt to have had a great influence in pointing the way to a more uniform standard of activity in traffic safety, and improved curricula and teaching.

by Jim Weidman
Publ: Journal of Traffic Safety Education v25 n4 p19-20 (Jul 1978)
1978
Availability: See publication

HS-023 692

THE ROLE OF EDUCATION IN PREVENTING MOPED ACCIDENTS

Moped education in the U.S. can proceed in several different directions. Obviously, the state licensing requirements will dictate the minimum age level of students. Elements common to the driving task and the motorcycle riding task must be identified. Some aspects of the moped riding tasks can be covered in high school driver education, especially in those programs which run a full semester; and all students can learn how to cope with the moped when driving a four-wheeled vehicle. Other aspects may be combined with motorcycle education. It seems clear that the moped rider should be familiar with the capabilities and limitations of cars and trucks operating in the highway transportation system with which he/she will have to compete. Where motorcycle education is well established, it may be expanded to encompass moped education. In other communities, special classes may be offered on an elective, after-school basis using school parking lots or other off-street areas as practice driving ranges. But any education program presumes that a curriculum is available, texts and other learning materials are on hand, qualified teachers ready, and school districts eager to get under way. However, none of these requirements to implement moped education programs are to be found. It is reasonable to assume that the National Hwy. Traffic Safety Administration will fund basic research on the moped riding task and development of performance standards by which qualified operators can be identified. But an equal, or even greater, responsibility falls to the moped industry and the American Moped Assoc. who must recognize their obligation to promote among dealers the need to establish moped safety classes within their communities and to encourage specialized education and training among their customers. The cooperation of moped dealers will be indispensable in support of moped education programs. The American Driver and Traffic Safety Education Assoc. and its affiliated associations stand ready to work with the moped industry and governmental agencies in curricula development, performance standards, and policies and guidelines for program organization and administration.

by Richard Kaywood

Publ: Journal of Traffic Safety Education v25 n4 p33-4 (Jul 1978)

1978

Presented at First National Moped Conference, Anaheim, Calif., 12 May 1978.

Availability: See publication

HS-023 693

TEENAGE TRAFFIC ACCIDENTS: HOW WOULD TEENAGERS IMPROVE THE RECORD?

Views of some teenagers who participated in the 21st Annual Chicago Motor Club Essay Contest for High School Seniors, the subject of which was ways to improve the traffic record of the teenager, are presented. Many of the more than 500 participants felt that the high school program of driver and traffic safety education was a valuable, lifesaving learning experience. They offered suggestions as to its improvement through lengthening and revising course content to include night driving, driving under adverse conditions, interacting with motorcycles, and more emergency driving exposure. An often used word in these essays was "responsibility," in reference to teenagers as well as adults. Overall, it was felt

that there is no means by which one can be made responsible and that responsibility is something which each teenager must acquire individually. Additionally, views were presented to the effect that society has too long neglected its responsibility toward the action of its youth, particularly in regard to their driving habits. The time to impress upon youth the serious responsibility they take on as drivers is before an accident occurs; teenagers want to be treated as adults by adults, not lectured. The teenager generally recognizes that he/she is at a distinct advantage in being an inexperienced driver. The responsible teenage driver feels that law enforcement of the young driver should be tightened. Also getting frequent attention was the opinion that tests for driver licensing should be made more difficult. Probably the most innovative suggestion was that a probationary license should be issued to 16-year-olds and 17-year-olds. The teenage authors, while offering suggestions on how to improve their traffic record, also analyzed the whys of this situation; the answer was expressed in two words: peer pressure. Other solutions to the teenage traffic record offered in one or more instances were to raise the drinking age to 21, have closer parental supervision, and establish traffic patrols exclusive of police.

by William L. Warner

Publ: Journal of Traffic Safety Education v25 n4 p35, 37 (Jul 1978)

1978

Availability: See publication

HS-023 694

UNCLE SAM'S USED-CAR LOT

A day at a government-surplus motor vehicle auction held at the General Services Administration's (GSA) Surplus Sales Center in Washington, D.C. is described; general information on the government car-selling business is provided. One of the myths about these government-surplus sales is that they are the exclusive province of used-car dealers. Approximately 95% of the customers are the general public, and 5% dealers. The prices paid follow a vague pattern: under \$300 for any visibly abused vehicle, \$350 to \$800 for sedans more than five years old, \$800 to \$900 for station wagons, \$700 to \$1400 for more late-model sedans, \$500 to \$1500 for pickup trucks, and \$1500 for anything with four-wheel drive. Every year the government sells roughly 60,000 vehicles (38,500 Jeeps and small trucks, 14,500 sedans and wagons, 5500 large trucks, and 1500 buses and ambulances). Besides the GSA, the Defense Department, the Postal Service, and the Treasury Department's U.S. Customs Service are in the car-selling business; each agency has its own specialty and its own way of selling. A few generalizations about buying a used government vehicle can be made. First, there is a distressingly consistent relationship between condition and price; more often than not, you are going to get what you pay for. Second, prices hover near wholesale; some are below, some above. And, third, just as in the conventional used-car business, regional variations do exist. Addresses of where to write or places to visit for information on government motor vehicle sales are provided.

by David Abrahamson

Publ: Car and Driver v24 n2 p83-4, 86, 89-91 (Aug 1978)

1978

Availability: See publication

HS-023 695

THE INCREDIBLE SHRINKING COP CAR [POLICE]

The effect of the downsizing of new cars to meet fuel-economy standards on the highway patrol chase-car situation in California and Nevada is discussed. By 1982, Detroit will be building all its cars with closed-loop monitoring technology designed to continuously adjust the fuel mixture to conform, mile by running mile, with emissions and fuel-economy laws; and the high-performance police car of today will no longer be built. A police car lasts only about two years; in contrast, the typical privately owned car may go ten years before it is scrapped. So the highway patrols in the U.S. are faced with an eight-year time lag during which they will be driving cars with smaller engines than those in the cars of a large segment of the civilian population. This differential presents problems for the police patrolmen across the country who are committed to the pursuit of highway speeders in order to command respect and save lives. But according to California and Nevada highway patrol chase-car specifications, all vehicles furnished must comply with the most current Federal Motor Vehicle Safety Standards, and Dept. of Health, Education, and Welfare Control of Air Pollution from New Motor Vehicles Standards.

by Leon Mandel
Publ: Car and Driver v24 n2 p45-6, 48, 50 (Aug 1978)
1978

Availability: See publication

HS-023 696

RECALL LETTERS AS EVIDENCE OF A DEFECT IN AN AUTOMOBILE

The controversy over the admissibility of an automobile recall letter, warning owners of a particular make and model of dangerous conditions in their vehicles, as evidence of such defect in a products liability suit against an automobile manufacturer for alleged defective design, is explored. The reasons for issuing recall letters, the effect on recall campaigns of Section 116 of the National Traffic and Motor Vehicle Safety Act of 1966, and the trend toward allowing such letters into evidence for limited purposes, are examined. In a products liability case a plaintiff must establish defectiveness twice, once at the time of the accident and again at the time the product left the defendant's hands. Prior to 1966, there was no law requiring auto manufacturers to issue recall letters or even warnings when a defect was discovered. The purpose of the National Traffic and Motor Vehicle Safety Act of 1966 was to provide a national program of automotive safety; as part of such effort, mandatory procedures to ensure notification and correction of manufacturing defects were established in Section 116 of the Act. No longer was a manufacturer forced to institute a recall campaign out of fear of being held negligent in a civil suit; it was now required by law. The courts therefore turned their attention to the proper evidentiary purpose a recall letter was to serve in proving the existence of a defect, either at the time of manufacture or at the time of the accident. The more recent cases, which admit the evidence of automobile recall campaign notices, seem to be more attuned to the policy behind the Act, as is the policy behind the whole field of products liability, which is to reduce the number of defective consumer products and thereby reduce the number of injuries caused by such products. The policy of holding a manufacturer liable for injuries caused by its defective products would be thwarted by exclusion of evidence which aids the plaintiff. Introduction of

such evidence is not going to cause auto manufacturers to be any less zealous in discovering and warning consumers of possible vehicle defects; automobile recall campaigns are mandatory. The recall notices are relevant to the issue of whether a defect existed in the vehicle at the time it left the manufacturer's hands. There is no logical reason not to allow admission of automobile recall campaigns into evidence.

by W. Terrell Wingfield, Jr.

Publ: Mercer Law Review v29 p611-8 (Winter 1978)
1978; refs

Availability: See publication

HS-023 697

AUTOMOBILE INSURANCE LOSSES. COLLISION COVERAGES. INITIAL RESULTS FOR 1978 MODELS

Results are presented of the collision coverage loss experience of 1978 model year passenger cars during their first six months of availability. The exposure for 1978 subcompact- and compact-sized models increased dramatically, accounting for 66% of the total exposure, compared with 30% for the 1977 models. Collision coverage losses for 1978 models increased substantially over corresponding losses for 1977 models. The claim frequency increased 7% to 11.9 claims per 100 insured vehicle years, the average loss payment per claim increased 10% to \$790 per claim, and the average loss payment per insured vehicle year increased 18% to \$94. Among the vehicle size groups, the changes in claim frequency ranged from -2% for the subcompacts to plus 6% for the full-size cars. The overall claim frequency increase of 7% was greater than that for any of the vehicle size groups, apparently due to the major changes in the vehicle size mix (increased proportion of small cars, which have higher claim frequencies). All vehicle size groups had increases in average loss payment amounts and average loss payments per insured vehicle year. The increases in average loss payments ranged from 4% for intermediates to 14% for compacts, and the increases in average loss payments per insured vehicle year ranged from 4% for the subcompacts and intermediates to 17% for the compacts and full-size cars. Average loss payments per insured vehicle year for three body style subgroups (regular two-door models, regular four-door models, and sports or specialty models) decreased with increasing wheelbase for subcompacts, compacts, and intermediates and increased again for full-size models. In each car size class, the average loss payments per insured vehicle year for sports or specialty models were higher than those for regular two-door models, which in turn were higher than those for regular four-door models. Sports or specialty models in each size class and regular two-door subcompacts and full-size models had average loss payments per insured vehicle year that were above the overall average, and regular four-door models in each size class were below the overall average. In every car size class, sports or specialty models generally had higher claim frequencies and average loss payments per claim than the other body style subgroups. The claim frequencies and average loss payments per claim for regular two-door models were almost always higher than those for corresponding regular four-door models. Among subcompacts, compacts, and intermediates, both claim frequency and average loss payment per claim decreased with increasing wheelbase. There was a four-fold variation in the range of average loss payments per insured vehicle year. The claim frequencies for the cars with the highest results were nearly twice those of the cars with the lowest results. The cars with the highest average loss payments per claim averaged over \$900 per claim, while

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those with the lowest average loss payments averaged less than \$600 per claim.

Highway Loss Data Inst., Watergate 600, Washington, D.C. 20037

Rept. No. RR-HLDI-R78-1; 1978; 55p

Availability: Corporate author

HS-023 698

OPTIMIZING DIESEL DESIGN

Manufacturers of diesel engines now are using analog computers to reduce and interpret design data introduced by pure math models or graphical analysis. With the new paper model computer techniques, a wide range of dimensional and performance possibilities can be examined by engineers at a relatively low cost in materials and time, and an exceptionally high level of confidence in design efforts can be provided. Before this, the cut-and-try method was a key design tool. The data monitored in test cells using strain gauges, accelerometers, thermocouples, pyrometers, and similar direct reading instrumentation are still used to reflect actual hardware performance; however, test cell results have turned out to be a verification tool for designs developed by computer techniques. Regulatory requirements are introducing new methods to control exhaust emissions and noise in the diesel engine. The most rewarding of the various methods to suppress noise has been the use of plastics. In most cases, redesigns using plastics exceeded noise requirements but plastic external engine parts sustained damage as a result of rough handling, as well as in a typical repair operation. Composite plastics, used for push rods, connecting rods, piston segments, etc. to reduce noise and weight, are prohibitive in cost (\$35-\$40/lb.). The reduction and management of exhaust emissions have literally been regulated as design requirements, leading to the increased use of turbochargers to help in controlling smoke. Although turbocharging improves power output and steady-state smoke, the transient problem of smoke on acceleration was created. To reduce this effect, a control device was added to increase the fuel supply, to be constant with the air supply from the turbocharger. This results in engine operation less than optimum, and a delayed throttle response. Likewise, technology to control nitrogen oxide emissions involves operating the combustion process under less than optimal conditions, resulting in low fuel economy and low hydrocarbon emissions. Contrary to the belief of many, diesel engines are going to increase in horsepower. This will naturally lead to advances to optimize fuel injection, turbocharging, air swirl, after-cooling, and consideration for turbocompounding (adiabatic engine). Ceramic bearings are under consideration to withstand the high temperatures in the turbocharger. Other possible uses for ceramics include push rods, tappets, cylinder liners, piston caps and valve seats. The next generation of bearings beyond ceramics will be air bearings, which involve no actual material contact during engine operation, but which require a mechanism to keep the shaft from hitting the outer shell of the bearing during start-up, engine vibration, and transient shock levels.

by Wesley A. Waters

Publ: Automotive Industries v158 n9 p26-32 (Jun 1978)

1978

Availability: See publication

HSL 79-02

HS-023 699

FIBERGLASS RADIAL USE EXPECTED TO INCREASE [TIRES]

Instead of flocking to the newer aramid-based fibers, some tire makers and automotive fleets are returning to the use of fiberglass for their tires in order to save money. Fiberglass-belted radial tires are helping Gelco Fleet and Management Services Co. keep its tire cost per mile below the national average. A representative of the company says that fiberglass radials are capable of 85% to 95% of the tread wear of the steel-belted tires, but are generally 20% to 30% below them in acquisition cost. In 1978, Detroit has equipped 17 new models with fiberglass radials. The return from steel to fiberglass shaves five pounds from the weight of the new models. Lighter weight is not the only advantage; radials with fiberglass belts have been judged to have a quieter, softer ride. Growing acceptance of glass radials by manufacturers is just one of the factors that will spur future market growth of fiberglass-belted radials; other factors include increasing demand in the replacement market and original-equipment light-truck use, and cost.

Publ: Automotive Fleet v17 n9 p42-3 (Jul 1978)

1978

Availability: See publication

HS-023 700

SMALLER CARS AND ENGINES IN STORE FOR FLEET INDUSTRY

The professional automobile buyers who took part in the discussion see challenging times ahead for professional fleet administration. Comments made express the views that the horsepower race is over, that metropolitan drivers will probably be driving small cars, that new car dealers are too often criticized, that the key word in any service is flexibility, and that the need for foreign oil must be reduced.

by John Beauchamp; Jim Lewis; Paul West; Gene Olson; William Ploof; Larry Palmer; Bod Adams; Bob Kneip

Publ: Automotive Fleet v17 n9 p24-6, 28, 30 (Jul 1978)

1978

Comments from a panel discussion, annual meeting of

Automotive Fleet and Leasing Assoc., Houston, 1978.

Availability: See publication

HS-023 701

REVISED WEIGHTING OF CVS/CH [CONSTANT VOLUME SAMPLING/CITY-HIGHWAY] TEST RESULTS FOR CO VEHICLE EMISSION FACTORS [FEDERAL TEST PROCEDURE FOR CARBON MONOXIDE]

There is not a good correlation between carbon monoxide (CO) emissions determined by the present CVS/CH (constant volume sampler/city-highway) Federal Test Procedure (FTP) and the high CO concentrations observed in urban centers. The Environmental Protection Agency (EPA) recognizes this deficiency of the FTP and is examining what is needed to correct it. Revised weighting factors are derived in the present study that can be used to correct present FTP CO data to improve the correspondence with the central city problem. These factors have been applied to a variety of FTP vehicle data. It

is found that the corrected CO emissions are not too different from the CO emissions calculated by the present FTP for pre-control cars and for pre-1975 cars. However, for 1975 cars that meet a stricter Federal Vehicle Emission Standard [VES], the present FTP overpredicts CO emissions significantly compared with the corrected values. The overprediction is greater for catalyst-equipped cars, particularly with air pumps, than for noncatalyst cars. The overprediction results from an overemphasis on cold-start emissions in the present FTP, and it is further exaggerated for catalyst-equipped cars because of the catalyst's ability to remove virtually all of the CO when warmed up and when sufficient oxygen is present in the exhaust. Analysis of the CO air quality problem has shown that the statutory VES of 3.4 g/mi is about a factor of 3 in excess of what is needed to achieve the CO AQS (National Ambient Air Quality Standard). The deficiency of the present FTP for CO emission determinations results in unnecessary further overcontrol. The methodology developed in this study could be applied to overcome this deficiency, until such time as revised FTP is developed by EPA.

by T. Y. Chang; B. Weinstock
 Publ: Journal of the Air Pollution Control Association v28 n7
 p700-3 (Jul 1978)
 1978; 10refs
 Availability: See publication

HS-023 703

SEASONAL OCTANE SPECIFICATIONS [GASOLINE]

The developmental approach, benefits and disabilities, and application of seasonal octane specifications are discussed. Petroleum marketers traditionally supply gasolines of constant octane quality year-round. However, car octane number requirements are not constant, but vary with atmospheric temperature and humidity. Adjusting octane quality to match seasonal changes in car requirements would result in less octane giveaway during periods of low requirements and would reduce gasoline manufacturing costs for the same year-round satisfaction. Because of the problems with exchanges, contract sales, and pipeline fungibility specifications, application of seasonal octane specifications on a widespread basis is not feasible unless they are generally accepted by the industry. Details on development of seasonal octane specifications are appended.

by B. D. Keller; J. H. Steury; T. O. Wagner
 Amoco Oil Co., Res. and Devel. Dept., Naperville and
 Chicago, Ill.
 Rept. No. SAE-780668; 1978; 12p 5refs
 Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun
 1978.
 Availability: SAE

HS-023 702

THEORY AND EVALUATION OF AUXILIARY COMBUSTION (TORCH) CHAMBERS

The theory for the design of an auxiliary naturally-aspirated combustion (torch) chamber relates the generation of combustion turbulence, intensity of turbulence, torch chamber volume, and orifice diameter to the basic combustion process. Sample calculations show how to compute the thickness of the combustion wave, the characteristic time of turbulence required to complete the combustion in a given time interval, the optimum torch chamber volume, and the orifice diameter. Results of engine tests show that a significant reduction in hydrocarbon (HC) and nitrogen oxides (NOx) emission levels can be achieved through the use of a torch ignition system. The combination of torch chamber geometry and torch nozzle orientation provides a control over the burn rate, rate of pressure rise, flame-induced turbulence, and swirl. Based on the data from the nozzles tested, the use of a swirling turbulent flame generated near the exhaust valve appears to be the most promising form of torch ignition. The addition of flame-induced turbulence and swirl to the air/fuel mixture motion promotes cylinder wall scrubbing and a reduction of the boundary layer problem. Consequently, the volume of unburned HC is reduced with a significant decrease in exhausted HC. Also, the quantity of NOx produced in the combustion process can be reduced by the use of a torch nozzle to control the burn rate, which in turn affects the peak temperature and the duration of the temperature at which NOx will form.

by T. G. Adams
 Ford Motor Co.
 Rept. No. SAE-780631; 1978; 22p 13refs
 Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun
 1978. Technical Paper Series.
 Availability: SAE

HS-023 704

DEVELOPMENT OF A FLAT SURFACE TIRE ROLLING RESISTANCE FACILITY

A high-speed, flat-surface tire rolling resistance test facility has been developed at the General Motors Proving Ground to evaluate resistance characteristics of a free-rolling tire and power transmission efficiency of a driven tire under controlled conditions. A continuous steel belt simulates the flat surface roadway. The tire contact patch is supported by means of a hydrostatic bearing. A new three-axis load cell has been developed to measure the low fore/aft and lateral forces in the presence of a large vertical force. The load cell allows use of a live axle. In addition to the description of the test facility, the measurement instrumentation, the annunciator system, and the machine performance specifications are described. The combination of test conditions and measurement accuracy provided by this new facility, which was not previously available, will allow engineers to evaluate tire/wheel performance with the overall goal of minimizing tire rolling resistance losses such that vehicle fuel economy may be improved.

by Stephen E. Lloyd
 General Motors Corp.
 Rept. No. SAE-780635; 1978; 9p 1ref
 Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun
 1978. Technical Paper Series.
 Availability: SAE

HS-023 705

ZINCROMETAL: ITS MANUFACTURE, TESTING, AND USE [AUTO BODY PARTS]

ZINCROMETAL, developed by Diamond Shamrock Corp., is steel that has been coil-coated with a two-coat system, a corrosion inhibitor portion called DACROMET, and a zinc-rich topcoat called ZINCROMET. The product provides corrosion protection, and can be formed into drawn auto body parts and

spot-welded at assembly plants with little or no difficulty. Diamond Shamrock has estimated the current added cost to produce a vehicle containing 500 lb of ZINCROMETAL vs. 500 lb of cold-rolled sheet metal would be approximately \$30, about one third the cost for less effective rustproof treatments applied after the automobile is purchased.

by F. H. Guzzetta
Armco Steel Corp., Res. Center

Rept. No. SAE-770362; 1977; 7p 3refs

Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.

Availability: SAE

HS-023 706

REPORT ON THE REVIEW OF HIGHWAY INQUIRY PROCEDURES. PRESENTED TO PARLIAMENT BY THE SECRETARY OF STATE FOR TRANSPORT AND THE SECRETARY OF STATE FOR THE ENVIRONMENT BY COMMAND OF HER MAJESTY, APRIL 1978 [ENGLAND]

The conduct of public hearings in England regarding proposed highways is reviewed. The purpose of these public hearings is to inform the Secretaries of State for Transport and the Environment of the weight and nature of objections to a road plan. At a few major hearings in England over the past two years, however, some meetings were disrupted to an extent which denied people most closely affected by the proposals a proper opportunity of expressing their views and explaining their interest. The inspectors charged with the fair and orderly conduct of these hearings, which take place under procedure authorized by Parliament, were severely hampered in the exercise of their duties. The key tasks of the inspector are to take account of objections from people affected by the proposals, to report on those objections, and to make recommendations to the Secretaries of State for Transport and the Environment on the proposals. The ultimate decision is not the inspector's; it is one which the two Secretaries take jointly, in the light of representations and objections, the inspector's report, and all relevant aspects of the government's policies. During the review of procedures in highway hearings three main issues emerged as being at the root of present dissatisfaction: the need for the road, where the road should run, and fair treatment at the proceedings. Action will be taken by the government with respect to public hearings on proposed highways to improve the situation.

Department of Transport, London, England; Department of the Environment, London, England

Rept. No. Cmnd-7133; 1978; 19p 6refs

Availability: Her Majesty's Stationery Office, London, England 35 pence

HS-023 707

THE BIG HEADACHES: ONE BY ONE [MAJOR ISSUES FACING MOTOR VEHICLE MANUFACTURERS]

The major issues of emissions and air quality, energy, safety, and maintenance/repair now facing motor vehicle manufacturers are discussed by the Chairman of the Motor Vehicle Manufacturers Assoc. (MVMA). The industry will make almost 13 million cars, trucks, and buses in 1978, and they will be more fuel-efficient, more compatible with the environment.

and less likely to experience a breakdown than ever before. Still, considerably more progress must be made to meet increasingly stringent government standards and ever-rising consumer expectations. With respect to auto emissions and air quality, studies are cited that indicate that there is no conclusive relationship between poor health and auto emissions, one of the principal issues surrounding air quality. With respect to another major air quality issue, the state of pollution monitoring is best described as primitive. Fuel economy standards mandated by the Energy Policy and Conservation Act of 1975 represent perhaps the greatest challenge for motor vehicle manufacturers. Energy conservation is also a challenge for manufacturers and users of larger trucks and buses, who are involved in programs such as the Voluntary Truck and Bus Fuel Economy Prog. The energy-saving efforts of motor vehicle manufacturers are not limited to fuel-economy improvements in vehicles themselves, but also to the entire manufacturing process. Safety has been a continuing concern to vehicle manufacturers, government, and consumers. One of the most significant recent automotive safety regulations concerns the requirement for passive restraints in cars beginning with full-size cars in 1982. Vehicle manufacturers will be facing other new safety requirements in the coming years, many of which were proposed in the National Hwy. Traffic Safety Administration's "Five Year Plan." With respect to a national transportation policy, the MVMA strongly supports the concept of the Federal Hwy. Trust Fund. With respect to vehicle maintenance, cars are more maintenance-free than ever before and mechanics are better trained, but much more work needs to be done to educate the owner to the need for and the techniques of proper maintenance.

by Semon E. Knudsen

Publ: Government Executive v10 n7 p23-4, 26 (Jul 1978)

1978

Automotive Issues Series.

Availability: See publication

HS-023 708

ULTRASONIC WELDING OF PLASTICS

The equipment used and some parameters affecting the design of the components to be joined in the ultrasonic welding of plastics are described. Three separate ultrasonic-welding processes are now firmly established; they are welding or sealing plastics to plastics, staking metal or other material to plastics, and insertion of metal into plastics. Welding and insertion are governed by the same principle. Ultrasonic vibrations of moderate amplitude are coupled at relatively high force to one component. Vibratory energy passes through this component and reaches the joint line or interface with a second component causing the parts to rub together, producing localized frictional heating. The plastics at the joint melt, usually in less than one second, and flow through the joint area. Staking involves the use of high-amplitude vibrations coupled to the plastics part at relatively low force. The plastics in contact with the work horn melt and flow to produce a rivet head, the shape of which is determined by the end profile of the work horn. In both types of application, the molten plastic solidifies when the vibration stops, producing high-strength bonds or fixings. The following five basic components of typical welding equipment are described: the power supply, the stand, the converter, the horn, and the booster horn. Design factors in welding are outlined and include material, shape, and joint design. The following material variables are discussed: hygroscopicity, mold release agents, lubricants,

plasticizers, fillers, regrinds, and resin grade. The advantage of welding (speed, consistency, strength, quality, no clamping, new possibilities, and automation) are outlined, and the characteristics of staking and metal insertion are discussed.

by Mike Finer
Publ: Engineering v218 n6 p1-8 (Jun 1978)

1978

Technical File No. 54

Availability: See publication

HS-023 709

WHAT'S NEW? [ELECTRIC COMMERCIAL VEHICLES]

Six British manufacturers are presently building electric vehicles, and there are over 40,000 electric vehicles in daily use in the U.K.; elsewhere in Europe, several thousand more of these vehicles are in operation, with no less than 13,000 in Japan. Some of the vehicles have been in use for over 16 years, and operating costs are reported to be relatively low. The main drawback is that most of the vehicles are slow, but recently a 35 cwt urban delivery van, the Silent Karrier, has been developed in the U.K. (Chrysler Corp., Chloride Group Ltd., and National Freight Corp.) that does 40 mph and can run 40 miles before its batteries need recharging. In addition, Volkswagen introduced in 1977 its electric-powered commercial transporter (microbus, van, or flatbed form) that is powered by a 1900-lb lead-acid battery, has a maximum speed of 44 mph, and a single-charge range of 31 to 50 mi. The Japanese have also developed several extended range electric vans and buses, some using hybrid batteries (lead-acid for rapid acceleration, and zinc-air for longer distance). The short-term developments in the lead-acid battery and improvements to the transmission should increase the operating range of the Silent Karrier to 50 mi, but in the longer term the use of sodium-sulfur batteries will be developed and will increase the operating range to 150 mi. Lucas Batteries Ltd. (U.K.) has based its extensive electric vehicle program on the GM Bedford range of light vans. This provides a compact one-ton payload vehicle with approximately one ton of battery weight. The van has a relatively high performance and maximum speed of over 50 mph. Development work on the Hobbs/AVS variable kinetic drive-type converter system for electric vehicles is continued by Advanced Vehicle System Ltd. (U.K.). A major vehicle manufacturer should soon be offering the VKD transaxle as an option in a small European car. The professional approach of the two main U.K. electric van developers should lead to economic mass production, thereby lowering the relatively high initial purchase cost. The government is providing a total of 400,000 pounds to produce 62 electric vehicles to be operated in the London area by commercial businesses and public organizations.

by Brian Chalmers-Hunt

Publ: Commercial Motor v147 n3756 (19 May 1978)

1978

Availability: See publication

HS-023 710

SWITCH TO ELECTRICS [ELECTRIC COMMERCIAL VEHICLES]

A preview of several papers to be presented at the Electric Vehicle Development Group's second international conference

in Sheffield, England on 23-24 May 1978, is provided. The conference/demonstration program has been called to examine the factors involved in using large numbers of high-performance electric commercial vehicles. An example of the current application of such a vehicle is cited; in Esslingen, West Germany, a prototype Duo-bus, powered from electrical overhead lines, or off-wire from batteries, has been running successfully in public transport since Dec 1976. A Dept. of Energy representative's paper discusses the Senate's favorable opinion of electric vehicles by its passage of the Electric Hybrid Vehicle Research, Development, and Demonstration Act in 1976, and the Act's revision in Feb 1978 which requires the purchase of 200 to 400 electric vehicles in the current financial year, 600 in 1979, 1700 in 1980, and at least 7500 in total during the succeeding four years. Another paper by a representative of the U.K. Dept. of Energy discusses estimated supplies of transport fuels to the end of the century. It states that within the U.K., supplies of off-peak electricity should not constrain the market penetration of electric vehicles in 1985, but by the end of the century, electric vehicles could face strong competition for available supplies of off-peak electricity. An engineering manager (power sources) of the Electricity Res. Assoc. (U.K.) provides an outline feasibility study of a combined overhead mains and battery-powered trolley bus, the Combat bus. Additional papers previewed concern operational requirements and experience with battery buses, the use of electric vehicles between transshipment depots and the retailer, and the potential for using electric vehicles as mobile libraries.

Publ: Commercial Motor v147 n3756 (19 May 1978)

Availability: See publication

HS-023 711

ADOPTION OF SHOULDER BELT USE AND CHANGES IN DRIVER ATTITUDES IN RESPONSE TO THE ONTARIO SEAT BELT LEGISLATION: REPORT ON AGGREGATE DATA

Shoulderbelt use of a total of 13,301 highway and 16,005 downtown passenger car drivers was observed every day or every other day in periods preceding and following the 1 Jan 1976 Ontario mandatory seatbelt wearing legislation. The changes in shoulderbelt usage over time were studied in relation to changes in drivers' opinions of the probable effectiveness of the law in saving lives, and attitudes towards implementation of the law. Opinion data were collected from 2057 drivers at various times throughout the study period. Average daily shoulderbelt use on the highway between 1300 and 1500 hours rose from 26% in the announcement period (law being announced but not yet in effect), to 46% in the in-effect period (law in effect, without being enforced), to 62% in the enforcement period. The corresponding percentages in downtown Kingston, Ont. between 1100 and 1200 hours were 8%, 31%, and 49%. It is emphasized that these percentages are averages obtained over periods ranging between 14 and 28 observation days. There was a decrease in both believed effectiveness and favorability of the law in Dec 1975 and Jan 1976 opinion surveys when compared to opinion surveys of a year earlier. From Feb 1975 to Jan 1976, no significant changes in believed effectiveness were noted, while there was an 11% and statistically significant drop in favorability. Moreover, the direction of change, but not the amount, was significantly negative within the period running from early Dec 1975 to the end of Jan 1976. It is thus interestingly observed that attitudes toward

the law changed significantly in a negative direction, while compliance with the law showed a significant increase in the same time interval.

by Gerald J. S. Wilde; Lois Cunningham; Cathy McKay
 Queen's Univ., Kingston, Ont., Canada
 Publ: "Traffic Injury Research Foundation of Canada Annual Conference Proceedings. October 6, 7, 8, 1976," Ottawa, 1976 p159-94
 1976; 13refs
 TIRF Reports series.
 Availability: Traffic Injury Res. Foundation of Canada, 1765 boul. St. Laurent Blvd., Ottawa, Ont. K1G, Canada

HS-023 712

PAINTING PRACTICES FOR GALVANIZED STEEL

Considerations in surface preparation and selection of paint systems for galvanized (zinc-coated) steel, used in automotive construction mainly because of its corrosion resistance, are outlined. First, crystal effects are discussed. Paint adherence is favored by two predominant factors, small grain size and high percentage of grains parallel to the surface. When galvanized steel is specified in a painted automotive application, the optimum type would be either electrogalvanized steel, temper rolled hot dip, or galvannealed. Zinc coatings of this type offer the greatest paintability in terms of cleanability, flexibility, smoothness, and overall performance. Galvanized steel should always be chemically treated prior to painting regardless of the crystal type. Next, the pretreatment of galvanized steel for painting is discussed. The following pretreatments are described: crystalline zinc phosphate, chromate, aqueous chromic-organic, acid-bound resinous, annealing heat, and amorphous complex-oxide. The following guidelines should be followed when the pretreatment is being considered: always use a chemical treatment; consult pretreatment supplier; store unpainted steel in a dry atmosphere; if painting aged-treated galvanized steel, pretreat again and consult chemical supplier; and paint immediately after pretreatment. Finally, paint systems are discussed in terms of criteria (number of coats, method of application, post-forming, corrosion resistance requirements, appearance, offline vs. online painting, cost, and pollution/energy), and paint types (solution vinyls, epoxy-ureas, epoxy-phenolics, alkyd-aminoplast, acrylics, and epoxy-esters).

by Mackenzie K. Endo
 Argo Paint and Chemical Co.
 Rept. No. SAE-770363; 1977; 7p 2refs
 Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
 Availability: SAE

HS-023 713

FORMABLE YET STRONG, DUAL-PHASE STEELS PRODUCE THINNER, LIGHTER [AUTOMOBILE] PARTS

Automakers, in their search for lighter materials, have come up with a new class of steel, a promising alternative for high-strength, low-alloy (HSLA) grades that are strong but difficult to form. Formability of the new steels, dubbed dual-phase because of their microstructure, is similar to that of aluminum sheet, yet these steels work-harden to yield strengths as high as 110,000 psi. Although dual-phase steels are no lighter than other types, the high yield strengths developed during forming

permit parts to be thinner and thus lighter. Initial development of these steels began in 1973 at General Motors, where researchers found that heat-treating HSLA steel could produce dual-phase properties; the heat treatment is basically an annealing process that can be performed on existing mill lines with only minor modifications. The formability of dual-phase steels is much better than that of HSLA steels, but not quite as good as that of conventional steels. The potential of dual-phase steels depends on the forming characteristics of the part, and deformation is necessary to reach the higher strengths. Lower-strength dual-phase steels have applications where forming requirements are demanding, and higher-strength grades, although not as formable, can provide significant weight reductions in comparison with conventional steels. The amount of weight that dual-phase can save, compared to mild steel, depends on the type of stress applied to the finished part and the grade selected. Tension forming produces the highest levels of strength and thus the greatest reductions in thickness and weight. Bending is moderately effective in increasing strength and reducing part thickness, while deflection produces no savings in thickness or weight. Unlike most conventional HSLA steels, dual-phase grades have a continuous stress-strain characteristic with no yield-point elongation. Thus stretcher-strain markings, or Luders' lines, are not produced as the steel is stressed. Such characteristics are important for applications such as automotive exterior panels. Presently several commercial grades of dual-phase steel are available and include J&L's Van-QN series, U.S. Steel's Dual-Phase 80, and Inland's Hi-Form 80d.

by David T. Curry
 Publ: Machine Design v50 n16 p54-7 (6 Jul 1978)
 1978
 Availability: See publication

HS-023 714

THE DRINKING DRIVERS COURSE IN IOWA: AN EVALUATION OF RECIDIVISM

Recidivism rates were studied for persons convicted of OMVUI (operating a motor vehicle under the influence) who attended and who did not attend the Iowa Drinking Drivers Course (DDC). Iowa became one of the few states to provide for a drinking driver's program on a statewide basis. The results of the recidivism rate comparison show that recidivism rates for persons taking the DDC course were lower for one year after conviction than the rates of persons not taking the course. However, the rates for two years after conviction are inconclusive, providing no evidence that the course has any lasting effect on the recidivism rate. One reason that these results are inconclusive is that the drinking and driving characteristics of persons convicted of OMVUI and attending or not attending the class were almost unknown, making it impossible to know whether class and no-class groups could really be compared. Also, the recidivism rates for two years after conviction show that persons who completed the course three or more quarters after being convicted had an average recidivism rate of 27.3% vs. 8.5% to 9.7% rates for persons taking the course within three quarters. When recidivism rates are reviewed by quarter over the eight quarters after conviction, recidivism frequencies show a pattern of initial increase, final decrease, and sharp intermediate increases and decreases. Additional findings of the study are that nearly 5% of the offenders had been convicted of OMVUI three or more times, and that more than 5% had been sentenced to and attended the class two or more times. These two findings suggest that Iowa

Dept. of Public Instruction personnel and traffic court judges have not developed or implemented a policy for special treatment of repeated offenders.

by Linda Tigges
Publ: Traffic Quarterly v32 n3 p415-32 (Jul 1978)
1978; 3refs
Availability: See publication

HS-023 715

THE PENNSYLVANIA TAXICAB INDUSTRY: DEMAND AND COST ANALYSIS

Cost and demand aspects of taxicab services in Pennsylvania cities are examined; implications of the study results are reviewed with respect to state-local government regulations of taxicab services and Federal transit subsidies. One finding is that, whereas taxicab ridership is highest among more affluent white urban residents, ridership is low among nonwhite residents, regardless of income levels. This suggests that economic incentives are necessary for service to nonwhite neighborhoods, either through subsidies or through permitting prices to rise to a level that would attract an adequate supply of service. Another finding is that small taxicab firms (10,000 to 350,000 annual trips or 20,000 to 600,000 riders) have a pattern of decreasing costs. This suggests that present regulations restricting entry into the taxicab business, based on an assumption that greater competition would lead to monopolies through economies of scale, should be reevaluated. A third finding is that taxicab usage is apparently not related to local bus service; thus Federal subsidies for bus systems since 1964 have probably not been an important factor in the steady reduction in taxicab demand. Rather, major causes probably include the sharp increase in multi-automobile households and the decline in number of no-automobile households. Further research is needed before the demand relationships between taxicabs and buses can be fully defined. Such research should encompass cities located throughout the nation and, most importantly, it should include more nearly complete data on quality and prices of bus service. In addition, a better understanding of taxicab demand could be achieved if the demand data were segregated into the most relevant groups (as opposed to aggregating all trips as was done in this study). Furthermore, many more influences than were considered in this study should be examined with respect to the cost analysis of taxicab services, and pricing and taxicab driver payment methods should be investigated to determine if different efficiency incentives give rise to measurable cost differences.

by Terence A. Brown; J. Michael Fitzmaurice
Publ: Traffic Quarterly v32 n3 p399-414 (Jul 1978)
1978; 4refs
Sponsored by Dept. of Transportation, Office of Univ. Res.
Availability: See publication

HS-023 716

IMPROVING PROSPECTS FOR PEDESTRIAN SAFETY

The National Hwy. Traffic Safety Administration's (NHTSA) and the Federal Hwy. Administration's (FHWA) approaches to pedestrian safety are outlined. NHTSA has developed a systematic approach to the collection, analysis, and interpretation of pertinent data that provides a logical framework for the identification of the following: major aspects of the pedestrian

accident process, methods of grouping these different aspects in order to understand accidents with common causal patterns, and the ways in which these patterns may be reviewed to identify possible countermeasures. One promising countermeasure is directed at children in kindergarten through third grade to reduce the dart-out accident, since these account for 33% of urban pedestrian accidents, and half involve children 5 to 9 years old. FHWA programs have as one objective the reduction of pedestrian accidents through the provision of adequate highway systems. The FHWA hopes that by establishing leadership and assistance at the Federal level, other levels of government that operate highway systems will be able to work more effectively to upgrade the safety of the pedestrian environment. The FHWA programs include a safety standards program, a highway construction program, a safety improvement program, a research and development program, a pedestrian safety engineering research project, and programs for elderly and handicapped pedestrians. In carrying out their joint responsibility for administering Federal programs for pedestrian safety, NHTSA and FHWA seek to assist states, local government, researchers, and citizen groups in generating increased activity and commitment toward reducing the nation's pedestrian accident toll.

by David I. Davis; Lawrence A. Pavlinski
Publ: Traffic Quarterly v32 n3 p349-62 (Jul 1978)
1978; 7refs
Availability: See publication

HS-023 717

MOTOR VEHICLE INFORMATION SYSTEMS WORKSHOP, APRIL 3-5, 1978, NETHERLAND HILTON, CINCINNATI, OHIO [SUMMARY OF PROCEEDINGS]

Topics and experiences covered during the course of the Workshop, attended by government and private-sector representatives, are summarized; various data systems used in motor vehicle administration, traffic law enforcement, and highway safety are discussed. The following topics are outlined: Ohio's Criminal Justice Information System (CJIS) and computerized procedures in the Ohio General Assembly; AAMVA/ANSI (American Assoc. of Motor Vehicle Administrators/American National Standards Inst.) D-20 Committee Report on the States Model Motorists Data Base; North Carolina's Financial Responsibility System of compulsory liability insurance and revocation of vehicle registration; computerization at R. L. Polk Co. (including motor vehicle statistics); Ohio On-Line Driver License System; Alaska DOT (Dept. of Transportation) data processing; staggered motor vehicle registration in Texas; VINA edit system in Missouri; Vermont Dept. of Motor Vehicles common name file; update on NHTSA (National Hwy. Traffic Safety Administration) DART (Data Analysis and Reporting Techniques) system; VIN (Vehicle Identification Number) status; New York State's Dept. of Motor Vehicles' Personnel Information System; National Auto Theft Bureau data system; update on IRIS (International Registration Information System); Virginia Div. of Motor Vehicles' Information System Plan (ISP) of 1977; postal regulations update (dimensional standards for mail); and Nevada Dept. of Motor Vehicles minicomputer system.

American Assoc. of Motor Vehicle Administrators, 1201 Connecticut Ave., N.W., Suite 910, Washington, D.C.
1978; 63p
Availability: Corporate author

HS-023 720

CHILDREN, TRAFFIC AND TRAFFIC TRAINING. AN ANALYSIS OF THE "CHILDREN'S TRAFFIC CLUB"

On the basis of empirical data, an assessment was made of the effect of membership in Norway's Children's Traffic Club (CTC) on children and their immediate families from the viewpoint of traffic safety. CTC is aimed at children in the 3-7 age group and consists of instructional materials on traffic safety which are designed to be used in the home in order to give parents an increased knowledge of their children's assumptions about and limitations in traffic, and to help parents teach their children how to behave in traffic. CTC aims to increase the child's ability to analyze a given traffic situation and to match behavior to it. This goal is reached by giving the child elementary knowledge about traffic and by creating correct attitudes and habits toward traffic. CTC was started in 1966 and by the beginning of 1974 had 85,000 members, about 30% of the population. Traffic instructions, geared to the different age levels, consist of repetition exercises and practical tests administered by the parents. The child receives two letters a year containing traffic material and a phonograph record. Parents are given guidance on how to introduce the instructional materials, as well as general traffic instructions for their own use. Among the analyses conducted in studying children were those of proficiency level, behavior level, and risk level. Proficiency involves two types of memory: reproduction and recognition. Factors in behavior are degree of attentiveness, attitude to traffic, play activity, age, sex, etc. A high level of traffic proficiency and an adequate behavior pattern do not in themselves guarantee a reduced accident risk, since there remains the degree of exposure. Parents' attitudes toward children and traffic in general were analyzed, as well as their experience with CTC as a training aid. It is concluded that the CTC contributes to the increased safety of children in traffic, as a result of higher levels of traffic knowledge and behavior. The CTC also contributes to elevating the parents' level of understanding, and appears to reinforce their attitude towards traffic safety. The CTC can cause a false sense of confidence among some individual member children, but this effect does not seem to apply to parents. The CTC is one-sided in that it is directed toward adjusting the child to traffic. Traffic safety is just as much a question of adjusting the environment to the child, and options for this aspect should be incorporated in the CTC. From a collective assessment, the CTC can be described as a positive endeavor.

by Per Schioldborg
 Psychological Inst. of the Univ. of Oslo, Oslo, Norway
 1974; 79p 26refs
 Sponsored by Ministry of Transport and Communications (Norway) in cooperation with National Traffic Safety Commission.

Availability: Corporate author

HS-023 721

STUDY OF EMISSIONS FROM 1966 THROUGH 1976 MODEL YEAR LIGHT-DUTY VEHICLES IN LOS ANGELES, ST. LOUIS, AND WASHINGTON, D.C.

In order to provide updated light-duty vehicle emission data for use in analyzing various mobile source control strategies, to assess the impact of mobile sources with advanced emission systems on air quality, and to provide data to assess the effectiveness of inspection/maintenance programs in reducing mobile source contributions to air quality, exhaust emission tests

were performed on 200 vehicles in Los Angeles, Calif., 50 vehicles in St. Louis, Mo., and 133 vehicles in Washington, D.C. All vehicles were tested using the 1975 Federal Test Procedure (FTP). Sulfate tests were performed on 82 vehicles in St. Louis. Evaporative emission tests were performed on 100 vehicles in Los Angeles. Additional emission tests were conducted on particular vehicles including Highway Fuel Economy Tests, modal tests, and a series of five short-cycle tests. The equipment and test procedures used are detailed. Appendices list the vehicle and test parameters; vehicle use data; vehicle maintenance data; and sulfate test procedure results. FTP results, evaporative emission results, and highway fuel economy and emission results for individual vehicles. Also included, for individual vehicles, are the following emission test modal results: Federal short-cycle, New York/New Jersey short-cycle, Clayton key-mode, two-speed idle, and Federal three-mode. Other elements in the program design were structured to obtain specific data concerning each individual vehicle's condition and configuration, quality control of test procedures, data reduction and vehicle procurement.

by Richard Carlson
 Olson Labs., Inc., 421 E. Cerritos Ave., Anaheim, Calif. 92801
 EPA-68-03-2379
 Rept. No. EPA-460/3-77-004; PB-279 247; 1977; 643p
 Availability: NTIS

HS-023 722

AMERICAN ASSOCIATION FOR AUTOMOTIVE MEDICINE CONFERENCE (22ND), AND INTERNATIONAL ASSOCIATION FOR ACCIDENT AND TRAFFIC MEDICINE CONFERENCE (7TH) PROCEEDINGS, ANN ARBOR, MICHIGAN, JULY 14, 1978. VOL. 1

Twenty-nine papers on automotive/traffic medicine are presented. Subjects discussed are as follows: traffic medicine as a part of preventive medicine teaching programs in Virginia medical schools; education of medical students about injury control; traffic accidents in Tokyo; road traffic accidents in Nigeria; the Abbreviated Injury scale (AIS); factors influencing biomechanical response and closed chest trauma in experimental thoracic impacts; social and interpersonal factors in driving; driver/vehicle characteristics related to accident vehicle condition and causation and an assessment of effectiveness of Indiana's periodic motor vehicle inspection; a comparison of selected daytime and nighttime driving performance; waiver of Federal requirement to issue knowledge examination on rules of the road; and severely and fatally injured rear seat car passengers (OAIS greater than or equal to 2) in Switzerland during 1976. Other papers discussed the following: rear seat automobile passenger in frontal crashes; biomechanics of automotive cervical fractures; top tethers for children's car seat restraints; drinking and drug-taking in road accidents in Great Britain; alcohol and drugs in traffic accident victims; an alternative injury code for police reporting; the New York State Injury Coding Scheme; fatal injuries to unrestrained passenger car occupants; fatal occupational injuries associated with motor vehicles; AIS and threat to life; characteristics of collisions involving non-impaired drivers; drugs and highway safety: research issues and information needed; characteristics of culpable drivers in rural accidents; financial and functional consequences of injury: a pilot clinical study; effect of quadriceps function on submarining; driving behavior of cannabis users and non-users in closed-course and normal traffic situations; driver licensing in Hungary; and a case study.

of external forces exerted on vehicles and vehicle occupants in an automobile accident.

by Donald F. Huelke, ed.
 American Assoc. for Automotive Medicine, P.O. Box 222,
 Morton Grove, Ill. 60053
 1978; 357p refs
 Includes HS-023 723--HS-023 751. Vol. 2 is HS-023 752.
 Availability: Corporate author

HS-023 723

TRAFFIC MEDICINE AS A PART OF PREVENTIVE MEDICINE TEACHING PROGRAMS IN VIRGINIA MEDICAL SCHOOLS

A unique cooperative effort by the three Virginia medical schools (Univ. of Virginia, Medical Coll. of Virginia, and Eastern Virginia Medical School), the Com. on Hwy. Safety of the Medical Society of Virginia, and the Hwy. Safety Commission of Virginia has made possible the beginning of a statewide training of medical students in the prevention of highway deaths and injuries. The salient features of the basic general program in traffic medicine are as follows: precrash anatomical and physiological factors in relation to trauma causation; postcrash damage to anatomical structures or physiological alterations; pathological alterations of tissues by altered state of health, intoxication, prescribed medication, and effects thereof on highway safety; environmental factors including the roadway and the vehicle; perceptive factors (lighting and behavioral variation in recognition and retention capabilities, coordination and reaction time in childhood, adulthood, and the elderly); the Abbreviated Injury Scale; multifactorial planning as a basic countermeasure: systems planning according to human, mechanical, design, and spatial limitations; the physician's role in relation to patients' illnesses, as an advisor, as an influence on safety legislation, and with regard to emergency medical service; and the physician as an educator in such areas as traffic villages, youth programs in schools, and the elderly and traffic. Six months after the initiation of this program, the interest of educators and the response of students are encouraging.

by J. C. Andrews
 Medical Society of Virginia, Hwy. Safety Com.
 Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p1-11
 1978; 2refs
 Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 722

HS-023 724

EDUCATION OF MEDICAL STUDENTS ABOUT INJURY CONTROL

A 20-hour basic medical school curriculum in injury control, as opposed to one designed solely to teach traffic medicine, is proposed, since a course dealing simply with traffic medicine is too restrictive for the needs of medical students. A broader course in injury events and injury mechanisms touches on practical problem-solving in the several areas of human development, counseling on emotional crises and drug abuse, chronic disease management, and response to acute trauma and its long-term effects. These subjects are ones that face the physician on a day-to-day basis. A curriculum should be broad

enough to be useful all the way from preventing injury in the infant to providing a fuller life to the disabled or elderly person. Such a curriculum emphasizes injury control as a logical extension of the physician's knowledge about his/her patients in their contexts as individuals and as family and community members, not only as drivers, passengers, and pedestrians. The twenty hours of the basic course in injury control are divided as follows: introductory statistics and concepts (1 hr); understanding and dealing with human factors (3 hr); environmental factors in the pre-injury phase (1 hr); environmental factors in the injury phase (2 hr); the post-injury phase, and training in emergency care (1 hr); and integrative exercises on highway and nonhighway injury events (2 hr). It is recommended that the course not be located entirely within a specific department, but rather designated as a course that is to be developed by representatives of several departments. Ideally, the course should be given in the second or third year of medical school.

by Julian A. Waller
 University of Vermont, Dept. of Epidemiology and Environmental Health, Burlington, Vt.
 Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p12-20
 1978; 5refs
 Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 722

HS-023 725

THE TREND OF TRAFFIC ACCIDENTS IN TOKYO [JAPAN]

Statistical data are presented for traffic accidents which occurred in Tokyo, Japan, during 1976, as well as data showing trends in the traffic accident situation since 1967. The population of the city is presently 11,675,000 with the number of automobiles reaching 2,741,500. In 1976, the number of traffic deaths and injuries were 350 and 42,284, respectively. Tables provide statistics on types of accidents, numbers of deaths/injuries for various traffic accident circumstances, location and severity of injuries sustained in traffic accidents, deaths/injuries according to age group, number of accidents (with corresponding deaths/injuries) according to time of day, number of accidents according to road situation, number of deaths/injuries according to driver traffic violation, number of deaths according to pedestrian traffic violation, deaths/injuries of children by age group and by type of situation (walking, bicycle, automobile), deaths/injuries of children by sex and age, and percentages of pedestrian accidents involving children according to type of inattentiveness shown by accompanying adult. In the past ten years, the population of Tokyo has remained fairly stable, whereas the number of cars has increased approximately 1.7 times. Nevertheless, traffic accident victims, whose number was at a peak in 1964, have started to decrease since that time. This trend is the result of the Traffic Safety Law implemented in 1970, at which time the following measures were put into action: rapid progress in the enforcement of safety facilities such as sidewalks, traffic signals, and traffic signs; a drive toward effective traffic regulations; improvement of the safety of automobiles; stress on traffic con-

HS-023 726

HSL 79-02

trol; establishment of a functioning emergency system; and promotion of safety education among citizens.

by Masayoshi Kimura

International Assoc. of Traffic and Safety Science in Japan, Accident and Emergency Com. of Tokyo, Tokyo, Japan
Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p21-25

1978; 25refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.

Availability: In HS-023 722

HS-023 726

ROAD TRAFFIC ACCIDENTS IN NIGERIA

An analysis is presented of the factors contributing to road traffic accidents and the pattern of injuries sustained by accident victims during the period Nov 1976-Oct 1977 in Lagos, Nigeria. Of the 5063 accident patients treated at the emergency department of Lagos Univ. Teaching Hosp. during this period, most of the injured were pedestrians (58%), followed by motorcyclists and pillion passengers (27%). The lowest number of accidents occurred during the rainy season (20%), as drivers tended to drive more slowly on account of flooding. The peak accident time was during the evening rush hour (8:00 P.M. to 10:00 P.M.). Of the drivers involved in accidents, 5% admitted to having taken alcohol or drugs prior to involvement. Fractures of the lower limbs accounted for 30% of all injuries, while serious head injuries accounted for 2%. It was found that lowering the surrounding temperature (to 25 degrees C) of patients with head injuries accelerated recovery. Brachial plexus lesion is on the rise among motorcyclists, accounting for 2% of the injuries sustained by these road users. Two percent of the children were injured at the same time as their mothers, since most mothers carry their offspring on their backs. Degloving injuries were the most common type of soft tissue lesion sustained by users of the expressway. There is inadequate training of drivers in Lagos as there are few driving schools and car owners are often taught by friends or relations. A large number of professional drivers are illiterate, and the inability to read road signs could lead to traffic accidents. A contributing factor to accidents involving commercial drivers was the lack of sustenance; the blood sugar of some commercial drivers who covered over 300 km without breakfast was found to be low (40-45 mg/100 ml).

by J. A. Shyngle

Lagos Univ. Teaching Hosp., Dept. of Surgery, Lagos, Nigeria
Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p36-43

1978

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.

Availability: In HS-023 722

HS-023 727

ROAD TRAFFIC ACCIDENTS: A MAJOR PUBLIC HEALTH PROBLEM IN NIGERIA

Analysis of data on road traffic accidents (RTA's) in Nigeria over an eight-year period (1967-1974) shows a rising trend. There were annually more deaths from RTA's than there were during the cholera epidemic of 1971. International comparison

of the RTA situation in Nigeria with that of industrialized countries (U.K., Sweden, and Australia) and developing countries (Zambia, Tanzania, Uganda, and Kenya) shows that Nigeria has by far the worst mortality and morbidity rates. The importance of the involvement of doctors, especially those in the field of public health, in the prevention of traffic accidents using the methodology which has been successful in the control of communicable diseases is stressed. Doctors in the field of public health and other specialties need to be involved in every aspect of the RTA problem, such as the treatment of the injured, advice on those medical conditions where driving is contraindicated, and research on the epidemiology of accidents.

by S. E. Asogwa

University of Nigeria, Dept. of Preventive and Community Medicine, Enugu Campus, Nigeria
Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p44-54

1978; 25refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.

Availability: In HS-023 722

HS-023 728

EVALUATING THE ABBREVIATED INJURY SCALE

The Abbreviated Injury Scale (AIS) has been evaluated in terms of three criteria (Gibson, 1976): the index must use data that are routinely collected in a hospital emergency department, whether or not patient is admitted; the index must use ratings which can be determined by nonclinicians and not require complex or subjective judgments by clinicians; and inter-rater and intra-rater reliability of the scale must be demonstrated. Inpatient charts for 98 trauma admissions (50 vehicular trauma patients, 48 victims of nonvehicular trauma) to Johns Hopkins Hosp. during Nov 1976-May 1977 were obtained from medical records and were processed by three coders. Coder 1 was a research worker with experience in medical abstracting and a sound knowledge of medical terminology but no clinical experience. The other two coders were nurses who worked in the Johns Hopkins Adult Emergency Dept. To examine comparability of AIS coding from the emergency department encounter sheet with coding from the inpatient record, coder 1 was asked to record and rate the severity of all injuries noted on the emergency department record for the subsample of 50 trauma patients. One month later she reviewed and rated injuries noted on the corresponding inpatient charts. To measure inter-rater reliability, all three coders rated injuries from the same 98 inpatient records. It is concluded that the inpatient chart is a more reliable and accurate source of information to use when coding severity, but coding AIS from an inpatient chart takes a coder approximately 15 minutes vs. 5 minutes from an emergency department record. Inter-rater reliability among all three coders as measured by the kappa statistic was .68. Coding reliability was higher for vehicular than for nonvehicular injuries. While inter-rater reliability was substantial, the following additions to and clarifications of the AIS coding and dictionary manual could reduce the percent disagreement to near zero: addition of several injuries/severity scores for nonvehicular trauma to the current dictionary; inclusion of explicit statement in the rules as to when multiple injuries are to be coded as one; and inclusion of a concise guide to anatomy and physiology as related to trauma. With these changes, a coder with training in medical terminology and abstracting should be able to code

severity accurately and reliably when sufficient information is provided in the chart. A coder with no clinical skills who cannot interpolate when sufficient information is lacking from the chart is more likely to be consistent in coding than a clinician. Differences in coding the AIS score will be accentuated when the total ISS (Injury Severity Score) is computed.

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 Publ: HS-023 722, "American Association for Automotive
 Medicine Conference (22nd) and International Association for
 Accident and Traffic Medicine Conference (7th) Proceedings,
 Vol. 1," Morton Grove, Ill., 1978 p55-66
 1978; 16refs
 Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 722

HS-023 729

FACTORS INFLUENCING BIOMECHANICAL RESPONSE AND CLOSED CHEST TRAUMA IN EXPERIMENTAL THORACIC IMPACTS [INJURIES]

Pertinent literature and accident statistics were reviewed to establish a field-relevant framework for an experimental traumatology study of the factors influencing biomechanical response and closed chest trauma in thoracic impacts. Since the actual site of thoracic load is not a fully-controlled factor in an automobile crash, the significance of variations in the location of a thoracic impact seems to warrant clarification as a potential factor influencing biomechanical responses and resultant trauma. In particular, closed-chest trauma to intrathoracic organs and vessels frequently results in a life-threatening experience. Various clinical investigation teams associate ruptures or tears of major thoracic vessels as a primary cause of death in 20% to 40% of automobile accident fatalities. The thoracic aorta is the most significant anatomical region of serious vascular injury. Arteriosclerosis is an additional confounding factor, which is frequently observed at autopsy, and has been suspected of predisposing the aorta to injury. In this experimental study, 58 anesthetized rabbits, eight with hyperlipemia-induced atheroscleroses, were exposed to blunt loadings of the thorax at various locations. The site of sternal impact was found to be a significant factor influencing the occurrence of serious intrathoracic injuries, such as aortic trauma. Midsagittal impacts centered above the midsternum produced frequent aortic, major vascular, and pulmonary injuries with minimal concomitant rib fractures, while impacts below midsternum resulted in diffuse liver lacerations and more extensive skeletal damage. Interestingly, intra-aortic overpressures were highest for impacts below midsternum, thus reducing the significance of this parameter as a dominant mechanism of aortic trauma. In a pilot study, match-tested atherosclerotic animals developed higher aortic overpressures and were more vulnerable to vascular liver injuries.

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 Publ: HS-023 722, "American Association for Automotive
 Medicine Conference (22nd) and International Association for
 Accident and Traffic Medicine Conference (7th) Proceedings,
 Vol. 1," Morton Grove, Ill., 1978 p67-82
 1978; 39refs
 Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 722

HS-023 730

SOCIAL AND INTERPERSONAL FACTORS IN DRIVING [PSYCHOLOGY]

Interviews were conducted with a random sample of 202 road users, using both quantitative and qualitative techniques, to determine reactions to a number of common driving situations (e.g. near collisions). Behavior of other drivers was seen as a major cause of potential danger in traffic, and psychological reactions while driving appeared to be markedly affected by the behavior of other road users. Drivers continually imputed motives, opinions, and values to other drivers on the basis of visible characteristics not directly related to driving skill; furthermore, many of the traits identified as characterizing dangerous driving referred to qualities of an interpersonal nature, including age, sex, and appearance. These results suggest that driving performance is not based solely on the practical, physical attributes of the driving situation, but also involves a social psychological process in which reactions stem from motives and attitudes that are inferred to exist in other drivers. This has both theoretical and practical consequences, and it is probable that driver education and remedial treatment programs for defective drivers could benefit from the insights of social psychological theory as an aid to understanding the process.

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 Publ: HS-023 722, "American Association for Automotive
 Medicine Conference (22nd) and International Association for
 Accident and Traffic Medicine Conference (7th) Proceedings,
 Vol. 1," Morton Grove, Ill., 1978 p83-97
 1978; 21refs

Sponsored by Transport Canada. Conference held at Ann
 Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 722

HS-023 731

DRIVER/VEHICLE CHARACTERISTICS RELATED TO ACCIDENT VEHICLE CONDITION AND CAUSATION AND AN ASSESSMENT OF INDIANA PMVI [PERIODIC MOTOR VEHICLE INSPECTION] EFFECTIVENESS

A separate study was performed as part of a major traffic accident causation project to investigate the relationships between driver/vehicle characteristics and vehicle condition and causation, and to evaluate the effectiveness of the Indiana Periodic Motor Vehicle Inspection (PMVI) program. Results indicate that the condition of accident-involved vehicles was significantly related to a number of driver/vehicle characteristics including driver age and education, and vehicle age and manufacturer. Vehicles in the poorest condition were driven by accident victims less than 20 years old, accident victims without a high school degree, divorced persons, laborers, individuals whose annual family income was less than \$3000, and victims who had not taken a driver education course; these vehicles were also more frequently old (12 years old or older) or were domestically manufactured. Vehicles in the best overall condition were driven by accident victims 55-64 years old, individuals with postgraduate or professional degrees, drivers who were married, students/white collar workers and professions, accident victims with annual family incomes of \$15,000 or more, and individuals who had taken a driver education course; these vehicles were also more frequently new

(less than one year old) or were manufactured in foreign countries. The likelihood of vehicular causal involvement in accidents was related to driver and vehicle age. Vehicles implicated most frequently were old (12 years old and older) and were driven by accident victims less than 20 years old. Concerning PMVI effectiveness, of the components which were judged to be causally implicated in the accidents, 51.7% were either not mandatorily inspected through Indiana PMVI or, if inspected, were judged to have been in a failing condition at the time of the state inspection.

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 Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p98-111
 1978; 7refs
 Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 722

HS-023 732

A COMPARISON OF SELECTED DAYTIME AND NIGHTTIME DRIVING PERFORMANCES

Forty subjects, evenly divided by sex, of similar age and driving experience, were tested for differences in day and night driving by driving the same test vehicle over the same test routes twice, once in the day and once at night. The test vehicle measured fine and coarse steering reversals, brake applications, and average speed in one-minute intervals over each of three route sections. (Section A, residential street with a school, a recreational area, apartment complexes, and private homes; Section B, rural two-lane highway with a bridge, curves, hills, and minimal shoulders; Section C, four-lane highway with grass median). Findings indicate that there were significant differences in driving performance from daytime to nighttime among all subjects. On the average, all subjects had lower average speeds during nighttime driving on all route sections. Also, all subjects had fewer mean control actions during the daytime, except for coarse steering reversals on section C, and for brake applications on sections A and C. There were no brake applications by any of the subjects during day or night over C. Between groups, males had fewer mean steering reversals than females, during both day and night, except for coarse steering reversals on B at night. Males also had fewer mean brake applications than females during day and night, except on A. Males drove at a higher average speed than females during both times of the day, except on C in daytime. Within groups, males had fewer mean control actions in the daytime than nighttime, except for coarse steering reversals on C and for brake application on A. The average speed of males was higher in daytime than nighttime, except on C. Females had fewer mean control actions in daytime than nighttime, except for coarse steering reversals on C, and they had higher average speeds on all route sections in the daytime. With respect to differences in the daytime and nighttime performances over the three road types, only one statistically significant difference was found for coarse steering reversals and that was with males driving on B. No differences were determined on brake applications. Fine steering reversals resulted in significant performances of males, females, and the total group between day and night over B. Also, the female group had significantly different driving performances for average speed during day vs. night over B and C, while males had significantly different performances over B. Males had relatively

higher day and night average speeds over A and B. No differences were found between sexes over the three routes during day and night for fine and coarse steering reversals, and brake applications. There were no significant differences in driving performance among subjects in different driving drivers.

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 Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p112-20
 1978; 12refs
 Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 722

HS-023 733

WAIVER OF FEDERAL REQUIREMENT TO ISSUE KNOWLEDGE EXAMINATION ON RULES OF THE ROAD: REPORT ON EVALUATIONS CONDUCTED BY STATES GRANTED WAIVER

The results of the driver licensing waiver programs conducted by the states of California, North Carolina, and Virginia produced mixed results on the efficacy of a mandatory knowledge test for all license renewal applicants. However, the need apparently exists for selected groups of drivers to receive a knowledge test at the time of renewal. For example, while the North Carolina waiver program results do not support subjecting all drivers to a knowledge examination upon renewal, the evidence exists that drivers under the age of 25 would benefit from the taking of such a test. Consequently, the National Hwy. Traffic Safety Administration (NHTSA) is moving to relax this requirement and permit state driver licensing administrators to use their discretionary powers and test those individuals who would most benefit. One state, NHTSA has taken to accomplish this change is the submission of an amendment to the Uniform Vehicle Code (UVC) that would make a test of knowledge of traffic laws on renewal discretionary rather than mandatory. The test waiver program as set forth in Section 402(a) of the Hwy. Safety Act of 1975 established the framework by which the states and the Federal government can work together to foster more beneficial programs in the field of traffic safety. It is to be hoped that such teamwork can be expanded into all areas and endeavors involving Federal, state, and local officials.

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 Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p121-8
 1978
 Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 722

HS-023 734

SEVERELY AND FATALLY INJURED REAR SEAT CAR PASSENGERS (OAIS [OVERALL

ABBREVIATED INJURY SCALE] GREATER THAN OR EQUAL TO 2) IN SWITZERLAND DURING 1976

An analysis is presented of OAIS (Overall Abbreviated Injury Scale) greater than or equal to two injuries sustained by rear-seat car occupants in Switzerland during 1976 from data collected as part of a one-year field study of car occupant injuries sponsored by the Swiss Federal Police Administration. The study was initiated in conjunction with the implementation of a mandatory seatbelt law on 1 Jan 1976. Special emphasis is given to child occupants under the age of 12, who, by the new legislation, are forbidden to occupy front seats. Among the 2115 injured back-seat passengers with an OAIS greater than or equal to one registered by the Swiss Federal Bureau of Statistics in 1976, 371 could be identified with OAIS greater than or equal to two. The accident data analyzed consisted of police reports, photographs, hospital documents, and personal questionnaires. Head injuries, especially concussion, were by far the most frequent injuries (and cause of death). Children sustained more head injuries than adults, but less lesions to the neck, the thorax, and the pelvis. Boys aged 6-12 exhibited significantly more severe injuries than girls (mean ISS (Injury Severity Score) 19.5 vs 5.0). Passengers in the center position sustained significantly lighter injuries, adults as well as children. The ejection rate of children was close to that of adults (13.8% vs. 13%). The individual effectiveness of seat belts in the back seat is assumed to be equal to that for front-seat occupants. Prevention of occupant/occupant contact increases the overall effectiveness as well. Unrestrained rear-seat passengers represent a significant hazard for the corresponding front seat occupants.

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 Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p129-40

1978; 40refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.

Availability: In HS-023 722

HS-023 735

THE REAR SEAT AUTOMOBILE PASSENGER IN FRONTAL CRASHES

The Hwy. Safety Res. Inst. (HSRI) data file of multidisciplinary, in-depth accident investigations (CPIR (Collision Performance and Injury Report) file) was utilized to examine the injuries to front-seat and rear-seat car occupants in frontal crashes. Occupant age, impact speed of vehicle, occupant seating position, and use of restraint systems were among the parameters studied. The potential of rear-seat occupants causing injury to front-seat occupants was also considered. Data analysis reveals that the rear-seat occupants are less likely to sustain severe-to-critical injuries and to be killed than front-seat outboard occupants, and that rear-seat passengers are most likely to escape a crash without injury. Children in the rear seat are less likely to be injured than rear-seat adults. Rear-seat occupants are less likely to be injured at all impact speeds. The most important factor found was the use of seat

belts. Belt usage by front-seat occupants was almost sufficient to eliminate the advantage of being a rear-seat occupant.

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Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p141-50

1978; 14refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.

Availability: In HS-023 722

HS-023 736

THE BIOMECHANICS OF AUTOMOTIVE CERVICAL FRACTURES

A description is provided of some of the causes of cervical loading observed in automobile crashes and resultant injury patterns which are commonly observed. The specific manner in which cervical loading occurs in a crash is of importance to the automotive safety designer who is concerned with protection of the neck. The subtle differences in the ways in which necks are injured may demand completely different forms of protection. The causes of cervical forces are described as either inertial loads, arising from unequal restraint of the head and torso, or compressing loads, due to external forces pressing against the body in opposite directions. Inertial forces generally can be classified as follows: head stops and body keeps moving; body stops and head keeps moving; and body and head both restrained, but unequally. Opposed external forces generally can be classified as follows: unrestrained object loads occupant; and opposing sides of compartment press against occupant. A beam block analogy to the cervical vertebral column is given to demonstrate the basic engineering principles of neck fractures.

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Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p151-68

1978; 9refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.

Availability: In HS-023 722

HS-023 737

CHILDREN'S CAR SEAT RESTRAINTS: WHEN TOP-TETHER STRAPS ARE IGNORED, ARE THESE RESTRAINTS SAFE?

The five children's car seat restraints top-rated by Consumers Union (CU) (Strolee, Century, GM, Swyngomatic, Teddy Tot) were impact sled tested properly installed on the sled with a top-tether strap as required, as well as improperly installed without the top-tether strap, secured only by the auto lap belt. A survey conducted by the Insurance Inst. for Hwy. Safety shows that such restraints are often improperly used in this manner. The restraints were tested in a 30-mph forward impact with a 3-year-old-size Sierra dummy. In addition to the five CU-rated restraints, two leading restraints not requiring a top-

tether strap, but secured by the auto lap belt (Bobby-Mac) were impact sled tested. Results show that the five top-tether strap restraints, when properly installed with the top-tether strap and lap belt, and the two restraints not requiring a top-tether strap but secured by the auto lap belt only, give good protection to the child in a frontal crash. It was also shown that, with one possible exception, the five restraints that require a top-tether strap do not provide adequate protection to the child if the top-tether strap is not installed.

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Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p169-87

1978; 26refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.

Availability: In HS-023 722

HS-023 738

A REVIEW OF DRINKING AND DRUG-TAKING IN ROAD ACCIDENTS IN GREAT BRITAIN

More than a decade after the introduction of the 1967 legislation which imposed a legal limit of 80 mg/100 ml of blood (or 107 mg/100 ml of urine) for motor vehicle drivers, alcohol is the largest single factor leading to death and injury in road accidents in Great Britain. It is estimated that currently the deaths of about one in five persons killed in road accidents result from drinking in excess of the legal limit. Although at least 200,000 casualties and 5000 deaths were judged to have been saved over the first seven years of the legislation, the effectiveness of the law gradually deteriorated with each year. This situation led to the establishment in 1974 of a Government Com. of Inquiry into Drinking and Driving. The main proposals arising out of the Blennerhassett Com. of Inquiry, reported in Apr 1976, were as follows: remove the present artificial limitations on the power of the police to stop and test drivers; determine blood alcohol by means of breath-analysis devices at police stations, with blood analysis as an optional final test; require offenders in "high risk" categories to apply to the court for restoration of their licenses, and show that they were taking steps to control their drinking; and mount a permanent program of publicity and education. Data for accidents occurring in England and Wales in 1976 in which motor vehicle drivers and motorcycle riders 16 or older were killed show that 38% of the motor vehicle drivers killed had BAC's in excess of the legal limit, and 14% with more than 200 mg/100 ml (24% and 7%, respectively, for motorcycle riders). National injury accident data for 1976 show that over 9600 drivers involved in injury accidents (out of a total of about 400,000 drivers involved) were found to have a positive roadside screening test. Relatively more passengers than drivers were killed or injured in the alcohol-related accidents, by a factor of two for fatal or serious injuries and a factor of 1.5 for slight injuries. Also, pedestrians are not blameless in alcohol involvement in accidents. Fairly substantial numbers of men and women take therapeutic drugs before driving. No evidence has been found to suggest that there is any material problem with the use of narcotics or hallucinogens (including cannabis) in Great Britain, and cases of drug abuse among drivers are rare. An epidemiological study should be con-

ducted on a qualitative basis to identify the main problem areas.

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Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p188-98

1978; 5refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.

Availability: In HS-023 722

HS-023 739

ALCOHOL AND DRUGS IN TRAFFIC ACCIDENT VICTIMS

A traffic injury population of 70 persons responsible for their own traffic behavior (i.e. all motor vehicle drivers, motorcyclists, and pedestrians over the age of 15) who were treated at the emergency department of County Hosp. in Varberg, Sweden, as of 1 Apr 1978, was studied in order to obtain data about alcohol and drugs as a traffic safety risk in an unselected injury population. The study was also expected to confirm earlier findings about heavy alcohol intoxication correlated with severe injuries. This investigation is unique in Sweden in that it is a study of a traffic injury population as a whole irrespective of the severity of injury or the medical measures taken. Only nine persons (seven motor vehicle drivers, two motorcyclists), 13%, had measurable concentrations of alcohol in the blood. Seven of these persons had a concentration exceeding 1.5 promille. A clear correlation between alcohol intoxication and severe injuries was found. Six persons of the total 70 declared that they were on continuous drug therapy because of chronic diseases. Two persons had taken benzodiazepines or aspirin in close correlation to the accident. No blood analyses for these types of drugs have been made to date. Urine samples for a few selected cases were analyzed for traces of drugs where it was felt that the drugs might be implicated; all analyses were negative. Alcohol intoxication is rare in a traffic injury population; there is a connection between severe injury and alcohol intoxication, and drug influence of any importance seems extremely rare in traffic accidents.

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Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p199-209

1978; 11refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.

Availability: In HS-023 722

HS-023 740

AN ALTERNATIVE INJURY CODE FOR POLICE REPORTING: AN EVALUATION OF THE NEW YORK STATE INJURY CODING SCHEME

The New York State Injury Coding Scheme (NYSICS) has been evaluated as an alternative to the K-A-B-C injury scale. The NYSICS consists of the following three components: the

location of the victim's severest injury, its type, and the victim's physical/emotional status. The assessment of the code was based on data from 18,228 occupants, who were involved in accidents investigated in 1974; the data set included 2027 documented injuries. Several different analyses were performed on the data, including the frequencies of omitted and incomplete codings by the police, a component-by-component examination of error patterns between coded and actual injuries, and an estimation of the ability of the NYSICS to predict the Abbreviated Injury Scale (AIS) rating of the actual injury. The latter analysis utilized the information theory concept of uncertainty as the measure of the NYSICS's predictive ability; this procedure was validated using rank-order correlation techniques. Generally, the police neglected to complete all three components of the code only in cases of extremely minor injuries or in ambiguous situations, e.g. similar abrasions to two different parts of the body. Furthermore, the police coding was fairly consistent with the medical reports, with the following exceptions: internal injuries often undiagnosed; and contusions and fractures frequently interchanged with one another, as were minor bleeding, contusions, and abrasions. NYSICS is an improvement over the more traditional K-A-B-C injury scale in predicting AIS. Thus, it is recommended that the NYSICS, with some minor changes, be implemented in other areas. Further areas of work include analysis of a greater number of severe injuries, development of guidelines to aid the police in choosing between two equally attractive alternatives, and methods to circumvent the problem of equating the most evident injury with the most severe injury. An effort should be made to obtain more information from the status component (which was coded "conscious" in over 80% of cases); perhaps an overall severity estimate would be beneficial, as well as grouping some of the less severe injury types. A drawback to the NYSICS is the problem of data analysis, given the large number of possible codes. Work on an accurate table converting NYSICS to AIS would be particularly useful.

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DOT-HS-053-3-609

Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p210-20

1978; 4refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.

Availability: In HS-023 722

HS-023 741

FATAL INJURIES TO RESTRAINED PASSENGER CAR OCCUPANTS

Ninety-four cases of belted occupants who were fatally injured in passenger car crashes were identified in the CPIR (Collision Performance and Injury Report) file at the Hwy. Safety Res. Inst. (HSRI) to determine the injury causation mechanisms, and the location of the injuries on the body. Injuries to the head/brain region of the body predominate in these data. A subset of the 94 cases in which the fatal injuries were incurred despite CDC (Collision Deformation Classification) extent codes of three or less, were studied separately to determine if additional occupant protection could have attenuated the injuries. Additional head protection and proper use of full restraints were judged to be most important for these cases. One or more of several approaches are in order for head protection. More padding of roof rails and A-pillars, the most frequent internal sources of head injury, may be desirable,

although there is a possible interaction with visibility. Full restraints, if properly worn, should help. But many of the head contacts cannot be protected against by padding the object, particularly those contacts with outside objects such as buildings, railroad engines, trees, poles, or the exterior parts of other vehicles. An alternative approach would be to protect the head itself with an appropriate helmet. Further analysis of the protective ability of various kinds of helmets is suggested, and the voluntary wearing of some sort of protective headgear is in order. Nearly all of the cases studied involve the use of lap belt only, and in several instances of lap/shoulder belt usage, the restraints were improperly worn. While injuries to the head/face/brain region and intrusion emerge as dominant factors, the question still remains as to how fully and properly restrained passenger-car occupants receive fatal injuries.

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Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p221-8

1978; 1ref

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.

Availability: In HS-023 722

HS-023 742

FATAL OCCUPATIONAL INJURIES ASSOCIATED WITH MOTOR VEHICLES

A study was undertaken of occupational fatalities associated with highway motor vehicles in Wisconsin to estimate the number of such fatalities, to estimate the annual per capita death rate for truck drivers, and to determine the limitations of various data bases for identifying vehicle-related deaths occurring at work. One hundred and sixty-one occupational injury deaths to Wisconsin residents during 1976 were identified from death certificates and from Worker's Compensation records; 37% of the total (59 deaths) were related to highway motor vehicles, 20% (23 deaths) were associated with trucks, and 14% (23 deaths) were truck drivers. The annual per capita death rate for truck drivers was 65/100,000, about nine times the rate for all other Wisconsin workers. Of the deaths associated with motor vehicles, 39% could not be identified from information coded from the death certificate and 36% were not reported to Worker's Compensation. The resulting estimates of truck driver death rates and of the proportion of all occupational deaths associated with motor vehicles are therefore conservative. Further studies are needed to determine rates elsewhere for truck driver deaths as well as rates for other workers who drive on the job, to examine the causes of the deaths, and to identify needed countermeasures. Clearly, in terms of both absolute numbers of occupational deaths associated with motor vehicles and death rates for truck drivers, the problem is enormous. Federal agencies have failed to address the issue. Protection of truck drivers and all workers who drive on the job is an urgent priority in occupational and highway safety.

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Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for

Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p229-41
1978; 21refs

Sponsored in part by Maryland Medical-Legal Foundation. Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 722

HS-023 743

AIS [ABBREVIATED INJURY SCALE] AND THREAT TO LIFE

Conjoint measurement and Stevens' psychophysical function were used to examine the relationship between the probability of death (or threat to life) and two injury severity measurements, AIS (Abbreviated Injury Scale) and ISS (Injury Severity Score). It was found that threat to life is essentially the sole criterion used in deriving the AIS scores, and the functional relationship between ISS and fatality rates can be well explained by Stevens' psychophysical function. The probability of death should be used directly to indicate the severity of injury, or as the sole criterion in deriving the AIS. The joint probability of death can then be calculated as a measure of the total severity of multiple injuries.

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Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p242-54
1978; 18refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 722

HS-023 744

CHARACTERISTICS OF COLLISIONS INVOLVING NON-IMPAIRED DRIVERS

A preliminary analysis is presented of the collision characteristics of three different groups of non-impaired automobile drivers, differentiated a priori on age-related factors. From the 904 automobile drivers fatally injured in 1976 as recorded in the data base on fatalities at the Traffic Injury Res. Foundation of Canada (TIRF), 386 non-impaired driver fatalities were derived and grouped as follows: 73 driver fatalities aged 16-19, inclusive, "inexperienced"; 116 drivers age 50 and over, "aging"; and 197 drivers aged 20-49, inclusive, "experienced". The variables examined were temporal (hour of crash, day of week, season), environmental (weather conditions, road surface condition, road geometry), crash dynamics (collision type (single vs. multiple)), driver action (apparently in error vs. apparently correct), driver error (no right of way, speed too fast, loss of control, wrong side of road, other), and other (driver sex, vehicle age). Based on the analysis, it is evident that differences exist in the collision characteristics of non-impaired drivers, when these victims are disaggregated by age/experience. The summary of the attributes of these groups produced two reasonably distinct profiles, one for the inexperienced driver and one for the aging driver. The attributes, those on which the particular group was shown to be overrepresented, are as follows: inexperienced drivers (night, weekend, spring, single vehicle, curve, speed too fast, male, older), and aging drivers (day, weekday, summer, multiple vehicle, intersection, loss of control, no right of way). A third profile, that of the experienced driver, is implicit since the at-

tributes of such drivers do not always cluster with those of the other two groups. Lack of specific overrepresentation on the various dimensions does create descriptive difficulties, however; more definitive features for the group may emerge in subsequent, more refined analyses using a larger number of cases which will permit more levels of the variables to be used. Of special note is that the profile of the inexperienced, non-impaired driver fatality is exceedingly similar to the profile of the collision-involved impaired driver, which has been reported elsewhere.

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Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p255-67
1978; 10refs

Sponsored by Motor Vehicle Manufacturers Assoc. and by Health and Welfare, Canada. Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 722

HS-023 745

DRUGS AND HIGHWAY SAFETY: RESEARCH ISSUES AND INFORMATION NEEDS

The relationship of drugs and traffic crashes has not been defined; present knowledge suggests that a problem may exist, but research has not established the risk of any drug other than alcohol. Present information cannot describe the extent to which the use of drugs (alone or with alcohol) increases the traffic crash risk, the manner in which drugs may alter human behavior to increase crash risk, the import of experimental studies that demonstrate effects of drugs on human behavior, and the meaning for impaired driving of drug levels in body fluids. Despite the breadth of the topic, which contains elements of both transportation and drug research, no common body of literature exists to unify the findings that link the use of drugs to problems in highway safety. The following research should have the highest priority for near-term research: specification of a set of "drugs of interest" that have the greatest likelihood of increasing crash risk; the conduct of large-scale field surveys to determine the prevalence of the drugs of interest in the accident and non-accident driving populations; development of methods for drug analysis that can detect and quantify the drugs of interest in body fluids easily obtained in a field survey setting (e.g. saliva); and the conduct of large-scale, coordinated experimental studies to determine driving-related effects of drugs that are overrepresented in crashes. The highest priority is the conduct of large-scale field surveys to determine the prevalence of drugs in drivers. Until these studies are done, the drug and driving problem will remain an undefined issue.

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DOT-HS-4-00994

Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p268-92
1978; 70refs

Sponsored by Motor Vehicle Manufacturers Assoc. Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 722

S-023 746

HOME CHARACTERISTICS OF CULPABLE DRIVERS IN RURAL ACCIDENTS

Data collected in 1971 and 1972 by the Pennsylvania State Police on 15,415 automobile accidents in rural Pennsylvania were analyzed to investigate the predictive ability of the following driver characteristics on culpability (of which a determination was made by the state police for each accident): age, sex, route familiarity, driving experience, and experience or familiarity with the accident vehicle. Iterative fitting methods and multivariate contingency table analysis were used to fit log-linear structural models to the data, to test the fit of these models, and to compare the predictive effect of these variables and their interactions. The results indicate that route familiarity is the strongest predictor, followed by age and driving experience. Driver sex and experience with the accident vehicle have only minimal predictive power. No interactions were significant; the route familiarity, age, and driving experience enter independently into the final model. Drivers unfamiliar with their route may be more vulnerable to inadequate controls, poor highway design, information overload, or other distractions at the time of the crash.

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OT-HS-801-398

Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p293-9
1978; 7refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 722

S-023 747

RESULTS OF FINANCIAL AND FUNCTIONAL CONSEQUENCES OF INJURY: A PILOT CLINICAL STUDY

Illustrative financial and functional consequences reported during two pilot surveys to investigate the feasibility of using personal interviews to collect information on the direct consequences of injuries sustained in automobile accidents on the victim, are presented. Data on 59 vehicle occupants drawn from the population of Washtenaw County, Michigan, in-depth investigations are summarized. Measures reported included lost wages, medical costs, impairment, property damage, legal costs, activity restrictions, and loss recovery. The time lost due to injury may be an exponential function of OAIS (Overall Abbreviated Injury Scale). In contrast to lower-level injuries, subjects with AIS-4 and AIS-5 (Abbreviated Injury Scale) injuries usually sustained closed-head injuries and had continuing physical impairment. All costs are reported in constant 1975 dollars and are compared with the Dept. of Transportation 1975 Societal Costs of Motor Vehicle Accidents.

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Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p300-18
1978; 9refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 722

HS-023 748

EFFECT OF QUADRICEPS FUNCTION ON SUBMARINING

Cadaveric injuries in simulated collisions are often more severe than those observed in the field for a given barrier equivalent velocity (BEV), since unembalmed cadavers are flaccid, while all accident victims have muscle tone. Although muscle tension may not be effective during the total period of deceleration, it can be a factor at its initiation and in controlling the subsequent kinematics of the victim. In an investigation of the effect of the quadriceps on submarining and on the injuries sustained by cadavers, 19 cadavers, some with a knee brace and all restrained with a three-point belt system, were subjected to simulated frontal collisions with sled equivalent velocities of 32 km/h to 65 km/h. Knee braces were used to simulate quadriceps function by providing a constant resistance of 61 N-m. Kinematics were analyzed by using high-speed cineradiography, and injuries were assessed by roentgenography and necropsy. The group of cadavers with no quadriceps function (flaccid knees, no brace used) submarined at 64 km/h and sustained severe intra-abdominal injuries which were far more serious than those reported from field studies. In the group with the knee brace, there were only a few abdominal injuries. Film analysis showed no significant submarining. Quadriceps function plays a role in the prevention of submarining in frontal collisions, and in cadavers muscle action should be simulated when evaluating three-point harness restraint systems.

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Publ: HS-023 722, "American Association for Automotive Medicine Conference (22nd) and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 1," Morton Grove, Ill., 1978 p319-29
1978; 5refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 722

HS-023 749

DRIVING BEHAVIOUR OF CANNABIS [MARIJUANA] USERS AND NON-USERS IN CLOSED-COURSE AND NORMAL TRAFFIC SITUATIONS

The driving performance in a nonintoxicated state of subjects who reported regular use of cannabis (marijuana) was compared with that of a group of nonusing controls matched for age, education, and driving history. Subjects were tested in a closed-course driving situation involving perceptual/decisionmaking tasks and high-speed driving. In addition to these measures, the subjects' road driving was monitored surreptitiously, by activation of a video tape recorder situated within the car, while the subject drove the car to the experimental track. The measures of driving performance in the closed-course and normal traffic situation showed some evidence for consistent driving patterns operating in both environments, particularly in the use of the vehicle controls and the speed of driving. The cannabis users did not differ from nonusers in their use of vehicle controls, speed of driving, or performance measures obtained in the closed-course situation. There was a difference, however, in overtaking behavior and indicator use in the normal traffic situation, suggesting some differences may exist in the driving pattern of nonintoxicated cannabis users compared with nonusers. These are related to

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the interpretation of the driving task and the subjective risks involved rather than in performance skills.

by Sally Casswell
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Publ: HS-023 722, "American Association for Automotive
Medicine Conference (22nd) and International Association for
Accident and Traffic Medicine Conference (7th) Proceedings,
Vol. 1," Morton Grove, Ill., 1978 p330-41
1978; 22refs
Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 722

HS-023 750

DRIVER LICENSING IN HUNGARY

The aim of the mandatory medical exam of drivers and license applicants in Hungary is to rule out all diseases, physical and mental disorders, and sensory dysfunctions that may negatively affect a person's driving ability; and to define the conditions under which persons suffering, to a certain degree, from such disorders may be able to drive. There are three types of medical examinations: a preliminary exam administered prior to starting a driver learning program, a periodic medical exam, and a special medical exam. The frequency of the periodic exam depends on the type of vehicle and license, and driver age. For example, professional drivers must be tested more frequently; these drivers under the age of 45 are examined every third year, every second year between the ages of 45 and 60, and annually over the age of 60. Special medical exams are performed at the request of the police; the employer of the professional driver; the Ministry of Health; National Board of Forensic Experts; and the organization testing occupational abilities. Every doctor of the National Health Service is required to report patients who have driver licenses for whom a diagnosis of any disease or condition that may affect driving ability is made. (The diseases are not listed.) When a person has been declared disabled, he/she may ask for a second examination which is generally administered by the National Board of Forensic Experts (as opposed to doctors employed at hospitals, clinics, or companies). If a person is turned down, he/she may ask for a revision of the decision. Finally, if still declared disabled, a person may apply for a revision by a new medical exam after six months.

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Publ: HS-023 722, "American Association for Automotive
Medicine Conference (22nd) and International Association for
Accident and Traffic Medicine Conference (7th) Proceedings,
Vol. 1," Morton Grove, Ill., 1978 p342-4
1978
Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 722

HS-023 751

A CASE STUDY OF EXTERNAL FORCES EXERTED ON VEHICLES AND VEHICLE OCCUPANTS IN AN AUTOMOBILE ACCIDENT

A detailed case study was made of an automotive accident in which two vehicles of nearly the same mass collided head-on, in a manner resembling a fixed-barrier frontal collision test. Both vehicles sustained damages of approximately the same

magnitude. The two unrestrained drivers were forced against their steering wheels; one sustained internal thoracic hemorrhaging and died, the other received a light chest contusion. The study estimated external forces (deceleration, SI (Severe Index), load, and load per unit area) exerted on both drivers and examined how differently these forces were applied and what factors caused this difference. These points were determined in a sled test of the steering system and in an automobile vehicle test, using a dummy in both tests. An examination of the behavior of the drivers leads to the assumption that the driver who was slightly injured, who did not strongly depress the brake pedal immediately before the crash, made an approximately parallel motion during the collision and his upper body was supported by the steering wheel. On the other hand, it is supposed that the fatally-injured driver, who had depressed the brake pedal immediately before the crash, pivoted around when the collision took place, and ultimately struck against the steering wheel, with his face a little upward. As a result, a great bending load was applied to the steering wheel, the steering wheel center pad was detached, and the steering shaft was bent approximately 40 mm at the joint. Human chest survival limits seem to have some correlation with pressure per unit area. When seat belts are not worn, load on the steering system must not only be in the horizontal direction in accordance with automotive standards, but also be applied at an angle from below.

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Publ: HS-023 722, "American Association for Automotive
Medicine Conference (22nd) and International Association for
Accident and Traffic Medicine Conference (7th) Proceedings,
Vol. 1," Morton Grove, Ill., 1978 p345-52
1978
Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 722

HS-023 752

AMERICAN ASSOCIATION FOR AUTOMOTIVE MEDICINE CONFERENCE (22ND), AND INTERNATIONAL ASSOCIATION FOR ACCIDENT AND TRAFFIC MEDICINE CONFERENCE (7TH) PROCEEDINGS, ANN ARBOR, MICHIGAN, JULY 14, 1978. VOL. 2

Twenty-five papers on automotive/traffic medicine were presented. Subjects discussed are as follows: occupant restraint in motor vehicles in Australia; runaway truck emergency ramps; crash injury and vehicle size mix; pattern of motorcycle injuries sustained by motorcyclists in Victoria (Australia) 1974-1975; motorcycle education and licensing improvement from past research to current demonstration to future implementation; knowledge and attitudes as predictor of motorcycle helmet use; head protection: preventive medicine in traffic safety; driver vision and accident involvement: new findings with new vision tests; health checks of motor vehicle operators; feasibility of designating medical examiners for international commercial drivers; driver licensing and public health proposal for collaborative efforts; pedestrian safety vehicle design elements; dual cardiopulmonary resuscitation in motor vehicles; the urban utility pole accident problem; effects of mandatory seat belt legislation on mortality and morbidity in Denmark; effect of mandatory crash-helmet use for motorcycle riders in Denmark; accidents involving buses and the need for safetybelt requirements in such vehicles; influence of vehicle design on pedestrian leg injuries; pedestrian head injuries.

cial injuries from motorcycle accidents; rural emergency medical service systems; engineering of protective headgear; moped accidents in select southern California communities; in-service failures of highway safety systems; and alcohol involvement in road crash casualties, Vic., Australia.

by Donald F. Huelke, ed.
 American Assoc. for Automotive Medicine, P.O. Box 222,
 Morton Grove, Ill. 60053
 Rept. No. Includes HS-023 753--HS-023 777. Vol. 1 is HS-023
 722; 1978; 350p refs
 Availability: Corporate author

HS-023 753

OCCUPANT RESTRAINT IN MOTOR VEHICLES IN AUSTRALIA

Over 70% of cars have had seat belts fitted as a result of the Australian Design Rule (ADR) program. Seat belts must be three-point lap-sash (sash not detachable) in all outboard seating positions with lap belts in center seating positions. In addition, the seat belts fitted to the front outboard seats must have dual sensitive retractors. In older cars, seat belts have been fitted to comply with retrofitting legislation and pre-ADR state requirements, while some have been fitted voluntarily by owners and manufacturers. There are no requirements to fit child restraints. Almost all cars on the road are fitted with seat belts for the front outboard positions, but rear seats have lower fitting rates. At least nine out of every ten car occupants at least eight years of age have a seat belt available, and very high wearing rates are now observed. The minimum age of eight years for compulsory wearing of seat belts applies throughout Australia with two exceptions; in the Australian Capital Territory the age limit is 14, while in Western Australia the age limit is five. In addition, children less than eight years of age in Victoria may only occupy front seating positions if suitably restrained, while in New South Wales children in both front and rear seats must use any available suitable restraint. Although significant reductions in casualties have occurred as a result of the ADR program for fitting seat belts and the compulsory wearing legislation and its enforcement, there are a number of groups who are not obtaining the benefits from being restrained. Wearing rates of rear-seat occupants are only one third those of front-seat occupants. It is difficult to enforce seatbelt wearing for rear-seat occupants because the wearing is not readily observable. Rear seat occupants are not provided with inertia reel belts so adjustment is more difficult, and there is a belief that rear seats are safer than front seats so there is no need for a seat belt. Wearing rates decrease with increasing occupant age. The youngest age group required to wear seat belts, the 8-13-year-olds, have the lowest wearing rate. A significant proportion of restrained car occupants do not wear their seat belt correctly adjusted; television public education ads have been effective in alleviating this problem. The use of restrained bassinets for infants is very low. Child seats (9 months-4 years of age) have the highest fitting and usage of all child restraints. Child harnesses, for the 5-7 age group, are also nearly always used if fitted. However, over two-thirds of children in cars are not restrained; an extensive publicity campaign to inform parents about the need to

restrain their children in cars is underway throughout Australia.

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 Publ: HS-023 752, "American Association for Automotive
 Medicine Conference (22nd), and International Association for
 Accident and Traffic Medicine Conference (7th) Proceedings,
 Vol. 2," Morton Grove, Ill., 1978 p1-14
 1978; 20refs
 Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 752

HS-023 754

AN EXAMINATION OF RUNAWAY TRUCK ESCAPE RAMPS

The effectiveness of the design of two runaway truck escape ramps along a section of highway in North Carolina has been and continues to be evaluated using photographic surveillance and accident data from investigation reports of ramp usage. Brake failures on large trucks descending steep grades in the mountains of North Carolina have annually accounted for a large amount of fatalities, injuries, and property damage. On 1 Feb 1974, the North Carolina Div. of Highways opened a runaway truck escape ramp on a 5-mile, 6% to 8% grade section of U.S. 70 between Ridgecrest and Old Fort, N.C. After the opening of this escape ramp, it was found that the ramp was used so frequently that an additional back-up ramp was constructed just downhill from the first ramp and made operational on 15 Dec 1975. The ramps are constructed of sand and are approximately 350 ft in length, rising in elevation from 0-10 ft above the roadway in order to present the truck with a level (0 percent grade) runway. The runway is approximately 30-ft wide at the mouth and widens to approximately 45 ft at the far end. The surface has been shaped into irregular surface mounds approximately 3 ft high on 15-ft centers. The accident study has shown the escape ramps to be highly effective. In all cases except one, the runaway vehicles were stopped, the sole exception involving an entry speed of 80 mph. Most ramp impacts produce only property damage. The recently undertaken photographic surveillance study of actual truck involvements, using two movie cameras with wide angle lenses, will aid engineers in determining the most effective design characteristics for future escape ramps (length, ramp grade, materials (e.g. pea gravel vs. sand), and the behavior of trucks with varying heights and weights at differing entry speeds). Initial and maintenance costs of the ramps are low; this combined with the overall low injury experience and low property damage to the vehicles make the project highly cost-beneficial.

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 Publ: HS-023 752, "American Association for Automotive
 Medicine Conference (22nd), and International Association for
 Accident and Traffic Medicine Conference (7th) Proceedings,
 Vol. 2," Morton Grove, Ill., 1978 p15-22
 1978; 1ref
 Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 752

HS-023 755

CRASH INJURY AND VEHICLE SIZE MIX

Since studies of the present accident population indicate that occupants of lighter and smaller cars suffer injuries of higher severity, there is a societal tradeoff between fuel savings and crash injury increase. To obtain this societal tradeoff, the relationship between vehicle weight and crash injury severity and the relationship between vehicle weight and fuel economy were studied. Crash injury prediction models were developed using data from the CPIR (Collision Performance and Injury Report) file for crashes which occurred since 1 Jan 1970, involving 1969 or newer cars, vans, and pickup trucks. Hostile and protective effects of vehicle size were separated in addition to injury severity increases with age, front seating position, and lack of restraints. Differences by crash configuration were also isolated. Elasticity of injury with respect to average vehicle weight change was computed using these models. Fuel cost decreases were compared with injury cost increases as vehicle weight decreases. Fuel cost savings exceed injury cost increases as vehicle weight is reduced, assuming no change in the relationship between vehicle volume and vehicle weight. Injury reduction from larger and lighter vehicles and from improved vehicle design could increase the difference even more.

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Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p23-39

1978; 1refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.

Availability: In HS-023 752

HS-023 756

PATTERN OF MOTOR CYCLE INJURIES SUSTAINED BY MOTOR CYCLISTS IN VICTORIA 1974-1975 [AUSTRALIA]

A survey of persons admitted to four Victorian (Australia) hospitals during 1974 and 1975 for treatment of injuries sustained in motorcycle accidents outlines the pattern of injuries and highlights the high percentage (73%) of serious local injuries to the lower extremities. Virtually all the fatalities among the motorcyclists occurred as a result of either serious head or trunk injuries. In the surviving motorcyclists, on the other hand, these injuries were far less common, the injuries being confined mainly to severe local injuries to the extremities, particularly the leg. The wearing of a crash helmet saved many from death and serious injury, but unfortunately there appears to be no accurate record of helmet performance. There were no cervical spine injuries in the patients admitted to the four hospitals. For the whole of Victoria, during 1974 and 1975, there were only three quadriplegics from cervical spine injuries; thus, in some way the crash helmet gives protection to the neck. This is not the case for motor vehicle accident victims where head and cervical spine injuries are frequently associated. The motorcyclist is usually thrown off the vehicle at the time of the crash and deceleration is probably slower than for the entrapped, but at the same time protected, car occupant. There was a surprising absence of damage to the scrotum, urethra, and bladder of the motorcyclist; and a particularly low incidence of fractured pelvis. The most striking feature of the survey was the very high per-

centage of severe crush injuries to the lower extremities, including a high percentage of compound fractures of the tibia and fibula and serious intra-articular injuries such as fracture dislocations of the ankle joint, tarsus and metatarsus and fracture dislocations of the femoral and tibial condyles involving the knee joint. Intra-articular injuries often left severe sequelae with painful stiff and later arthritic joints. The majority of motorcyclist victims interviewed favored increased visibility with bright clothing, white helmet, and headlight during the day; stricter licensing, adequate rider instruction and compulsory restriction of bike capacity (below 250cc) for learners; and the wearing of crash helmets (law in every Australian state). Recent steps by authorities include an education program for motorcyclists and car/truck drivers, the promotion of stricter licenses (with possibly graded licenses), and possible abolition of pillion riding.

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Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p40-8

1978; 3refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.

Availability: In HS-023 752

HS-023 757

MOTORCYCLE EDUCATION AND LICENSING IMPROVEMENT FROM PAST RESEARCH TO CURRENT DEMONSTRATION TO FUTURE IMPLEMENTATION

A three-phase plan for reducing motorcycle-related deaths, injuries, and economic losses through motorcycle operator education and licensing improvement offers a systematic approach to the development and evaluation of promising motorcycle accident countermeasures. Significant efforts are cited at all levels of government and in the private sector during the 1970's in the U.S. Phase one, early research and development (1973-1975) creating the Motorcycle Task Analysis and related studies and documentation, is complete. This phase determined what constitutes safe motorcycle operation. Building upon this basic foundation, Phase two, a current demonstration project (1975-1978) funded by the National Hwy. Traffic Safety Administration in motorcycle licensing improvement was planned and initiated. Phase three concerns current and anticipated (1978-1982) efforts to implement and evaluate the accident countermeasure potential of a quality motorcycle rider education course. Three themes are evident throughout the discussion of this motorcycle education/licensing improvement program: the validity and effectiveness of program implementation and change are directly related to antecedent research and development; successful public/private sector traffic safety efforts are rare but possible; and, with sufficient long-range planning and institutional commitment, cost-effective accident reduction measures can be developed, tested and proven or disproven in actual practice.

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Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for

HS-023 758

KNOWLEDGE AND ATTITUDES AS PREDICTORS OF MOTORCYCLE HELMET USE

Matched samples of motorcycle riders from mandatory and nonmandatory helmet use states in the Midwest were tested to determine knowledge about motorcycle helmets and attitude toward motorcycle helmet use. A total of 391 motorcyclists were given the tests. Knowledge test scores showed no statistically significant differences. However, knowledge of both groups was low, indicating a lack of information on helmets in reducing the likelihood of head injury. The attitude scale was found to be a good predictor of helmet use in the sample data derived from the nonmandatory helmet use state. In addition, attitude toward helmet use was significantly more favorable for the subjects from the mandatory use state.

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Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p60-8
1978; 7refs
Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 752

HS-023 759

HEAD PROTECTION: PREVENTIVE MEDICINE IN TRAFFIC SAFETY

In the period studied (1957-1977), 617 cases of helmeted head impact in vehicular accidents were investigated in-depth, and extensive dynamic testing of protective headgear in the laboratory was performed. Findings were reproduced in the impact laboratory, and these combined data have led to a somewhat better understanding of human tolerance to impact. Cases were limited to helmeted head impacts in which adequate data were available concerning the three basic components: helmet, head, and impacted object. As for design criteria of protective headgear, the importance of maximizing the area of helmet coverage has been clearly demonstrated; current standards such as that of the Snell Foundation (1975) have been developed to take this into account. Current test techniques for the resistance of helmets to penetration by sharp objects are adequate, especially in view of the relatively low exposure to such surfaces seen in this study of field accidents. However, it would be ill-advised to reduce the severity of such a test requirement since impact sites have penetration potential. Failure of the helmet to be retained under impact conditions in an accident appears to be of low incidence in this accident study (3.8%); however, in 38% of these cases, a fatality due to head injury resulted. Current tests of harness strength could be improved by a more realistic dynamic test which would simulate an impact circumstance. Of greater importance is the need for a method of study of retention of the helmet on the

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EC-00013

Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p69-80
1978; 7refs
Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 752

HS-023 760

DRIVER VISION AND ACCIDENT INVOLVEMENT: NEW FINDINGS WITH NEW VISION TESTS

An evaluation of a fully automated battery of driving-related vision tests, named Mark II (developed by Honeywell, 1975), was conducted on 890 licensed drivers ranging in age from 17 to 89. The tests measured static central visual acuity under conditions of optimal illumination, low levels of illumination, and glare; dynamic visual acuity, visual field, movement detection threshold in the central and peripheral fields, and visual search-and-scan ability. Regression analysis of performance on the vision tests against accident involvement yielded multiple correlations ranging from 0.09 to 0.30, depending on the particular driver age group and the accident condition (day vs. night). Dynamic visual acuity and static acuity under low levels of illumination were the two tests that were most consistently related to accidents in general, as well as to driver-caused and vision-related accidents in particular. Poor static acuity under low levels of illumination was specifically associated with overinvolvement in nighttime accidents. The third most relevant vision test was sensitivity to central angular movement. When broken down by age groups, no single vision test was significantly associated with accident involvement for all groups, but each one of the vision tests was significantly associated with accident involvement for one or more of the groups. Additional changes in equipment and procedures are necessary before the battery can be used in the driver licensing environment. The reliability and stability of the vision test scores should be increased before pass/fail criteria can be applied, and the total test duration should be shortened in order to be practical in the licensing station. These two conclusions imply conflicting demands; one practical approach to this dilemma is to consider a selective vision testing program. Three potential approaches can be considered: identify the tests that are most relevant to each of the age groups, and to each driver, depending on age, and administer these tests only; administer the Mark II tests selectively to "problem" drivers (e.g. old drivers or drivers who have failed the standard test); and eliminate periodic reexamination by all but the two most important tests (e.g. DVA (dynamic visual acuity) and SA-L (static acuity-low illumination)) until the age of 50.

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DOT-HS-5-1275
Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for

Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p81-91
1978; 11refs
Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 752

HS-023 761

HEALTH CHECKS OF MOTOR VEHICLE OPERATORS

Medical examination of all driver's license applicants has long been mandatory in Sweden, but no study has ever been made to determine the value of such an examination. This investigation to determine its value is based on 2000 health declarations and doctors' reports; diseases and disorders considered hazardous to driving which have been reported by physicians to county medical officers; and driver's license medical cases handled by the Legal-Medical Council of the Swedish National Board of Health and Welfare, etc. First-time driver's license applicants and former holders of driver's licenses are separately considered. The results of this study do not support the mandatory medical examination of all driver's license applicants. It is proposed, however, that the examination requirement be retained for professional drivers because of the special demands placed on this group. All applicants for a driver's license should undergo a vision test; such a test would not necessarily have to be performed by a physician. The requirement for doctors to report to driver-licensing authorities certain diseases and/or disorders of patients who are licensed drivers is questioned. Patients with traffic-hazardous diseases/disorders who are licensed drivers should be made aware of their situation and advised by their physicians about their participation in driving. Such disorders as mental disturbance, chronic alcoholism, drug addiction, diabetes, epilepsy, poor eyesight, and progressive eye diseases should be reported to driver-licensing authorities for evaluation on an individual basis. A referral to the licensing authorities of such disorders does not necessarily mean revocation of the driver's license.

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Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p92-106
1978
Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 752

HS-023 762

FEASIBILITY OF DESIGNATING MEDICAL EXAMINERS FOR INTERSTATE COMMERCIAL DRIVERS

An investigation was undertaken to examine ways to develop and strengthen the Bureau of Motor Carrier Safety's (BMCS) medical certification program for interstate commercial drivers. In accordance with current BMCS regulations, a truck or bus company is required to maintain an up-to-date driver qualification file for every driver in its employ. Among other documentation, the file must contain a physician's certificate of the driver's medical capability to operate a motor vehicle in interstate commerce. In order to be employed as an interstate

commercial driver, a person is required to have a complete physical examination by a physician of his/her choice initially and every two years thereafter in order to be certified medically able to operate a motor vehicle. If a driver changes employment in the interim, the new motor carrier may require an exam, or may simply accept the existing certification if within the two-year limit. At present, the majority of physical exams are conducted by family physicians who may or may not be familiar with the BMCS's minimum requirements for certification and who often are even less familiar with the driving task. If a company questions the physical examination form of the driver's physician, or for any reason feels the driver may not be medically fit, it may require a second exam by a physician of its choice. In large industry, the physician would probably be the company's own medical doctor. Should a conflict of medical opinion arise between the first and second physicians, the driver must be examined by a third physician mutually agreed upon by driver and company. The third physician must provide evidence that he/she is fully aware of the driver's complete medical history and of the nature of the work to be performed. The overriding consideration in this investigation was the practical question of whether there are enough "qualified" medical personnel to accommodate the number of interstate drivers involved. Alternative systems could improve significantly the effectiveness of the current BMCS program. These alternatives include establishment by the BMCS of a depository for physical examination forms for all interstate commercial drivers; selection of third physician from a list of designated medical examiners; establishment of regional medical advisory boards as third physician opinion; use of a team approach consisting of the previous two options; issuance by the state of a chauffeur's license for commercial drivers, and initial screening by the state of the medical reports of the driver's physician; and use of existing state medical advisory boards on driver licensing as third physician option.

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Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p107-24
1978; 24refs
Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 752

HS-023 763

DRIVER LICENSING AND PUBLIC HEALTH: A PROPOSAL FOR COLLABORATIVE EFFORTS

The state agencies responsible for improving driver performance and for improving the health and welfare of citizens could perhaps better achieve the overall goals of state government by cooperation. Two specific collaborative efforts are described. It is proposed that driver licensing programs present an excellent opportunity to screen the majority of the adult population for the detection of certain health problems shown to be associated with poorer driving, e.g. hypertension. As is presently done in the case of vision testing, the examiner could refer for more expert medical evaluation wherever appropriate. Follow-up and evaluation could be handled automatically through renewal license procedures. Second, driver improvement personnel may be of more service to the problem driver by informing him/her of a variety of health and social services available in the community. The "problem driver" is frequently a person with problems that have spilled over into his/her driving, and traditional driver improvement measures

are not relevant. Other resources may be of more benefit and lead to improved driver performance. In all instances, driver-related decisions would remain in the hands of the licensing authorities, while health and social-service decisions would be made by appropriate professionals. These proposed efforts represent low-cost approaches to achieving more effectively some of the overall goals of state government.

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 Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p125-31
 1978; 4refs
 Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 752

HS-023 764

PEDESTRIAN SAFETY VEHICLE - DESIGN ELEMENTS - RESULTS OF IN-DEPTH ACCIDENT ANALYSES AND SIMULATION

Design elements are proposed for a motor vehicle that will be safer with respect to pedestrians. The proposed features that will minimize the trauma of pedestrians at impact are based on an evaluation of real accidents, and experimental and mathematical simulation. The in-depth studies of 200 pedestrian accidents primarily evaluated the aggressiveness of car parts with respect to injury severity and frequency, and their combined societal costs. Pedestrian accidents were analyzed separately for adult and child involvement. Car elements with curved front shapes were compared with elements with square front shapes. The simulations provided data on the kinematics and dynamics of pedestrian collisions, e.g. impact points or dummy loadings in relation to parameters such as dummy height, front-end design, and velocities of car and dummy. The countermeasures (passive and active systems) necessary for pedestrian protection in car-to-pedestrian collisions are rated according to effectiveness, practicability, and priority. Those with the highest priority include rounded front end, soft face, deformable bumpers, and rear location of antenna.

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 Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p132-53
 1978; 20refs
 Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 752

HS-023 765

MACHINE CPR VS MANUAL CPR IN MOVING VEHICLES [CARDIOPULMONARY RESUSCITATION]

In research conducted utilizing a cardiopulmonary resuscitation (CPR) machine vs. manual methods of CPR, the CPR machine showed a clear superiority. Recording manikins were used to determine proper hand placement, proper compression rate, compression force, and missed beats on all tests. Recordings were made from onset of CPR until the patient

(manikin) was delivered into the hospital. CPR was started on the floor of a building by manual methods using American Heart Assoc. standards. The manikin was then loaded onto a stretcher, wheeled to the waiting ambulance, loaded into the vehicle, and transported under emergency conditions to a hospital 28.9 km from the starting point. Using the CPR machine, there were nonvarying rate of compression over 21-minute tests; constant compression; stroke depth; no missed beats because of curves, or stops and starts; and no incorrect compression placement. In the manual method of CPR, there were 336 incorrect pressure points, 24 missed beats, and a rate that ranged from 60 to 84 beats per minute and varied periodically from not enough to too much pressure. With the machine, there was a 30-second period of inadequate compression on setup and a 12-second period of inadequate compression on switchover from portable to fixed oxygen source. The machine operated consistently at a rate of 54 compressions per minute. From a practical sense, when mechanical CPR was performed, fatigue was not a factor with the rescuers, and fewer personnel were required to transport the victims to the hospital. In addition, when the machine was used the patient was more accessible to the paramedics for administering drugs, defibrillating and monitoring because there were fewer people necessary.

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 Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p154-64
 1978; 5refs
 Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 752

HS-023 766

AN ANALYSIS OF THE URBAN UTILITY POLE ACCIDENT PROBLEM

A study was undertaken to determine the extent of the utility pole accident problem in U.S. urban/suburban areas and to identify factors which affect the probability of their occurrence and their severity. Police reports for 1975 were obtained for over 8000 single-vehicle accidents occurring in 20 urban/suburban areas throughout the U.S.; to supplement the police-reported data, each accident site was visited and inventoried to record such data as utility pole spacing and offset, relevant highway characteristics. The results indicated that utility pole accidents are a significant problem in urban areas, in terms of both frequency and severity. Utility poles were the most frequent object struck, accounting for 21.1% of all objects struck. This figure, when combined with national figures, suggests that 2.2% of all urban accidents involve utility pole impacts. Apart from accidents involving rollover, utility poles have the highest rate of injury involvement. By comparing utility pole accidents to a sample of other single-vehicle accidents not involving pole contact, parameters which affect the probability of pole contact were identified and include, in order of relative importance, the number of poles in the immediate roadside environment, their offset, road grade, road path, and speed limit. Injury severity in utility pole accidents (50.5% of which were injury-producing) appeared to be primarily a function of the stiffness of the struck pole and the impact speed. Utility-pole accidents were overrepresented on roads with speed limits of 30-40 mph (proportion decreasing after 40 mph) and widths of 30-50 ft (related to higher than average pole densities). The proportion of accidents increased

with travel speed; however, travel speed was unknown in 72% of the cases. Accidents were overrepresented on straight roads, and on left curves vs. right curves; accident frequency was higher for right side than for left side departures. The proportion of accidents decreased as a logarithmic function of the proportion of run-off-road accidents that occurred where there were no poles; it decreased as pole spacing increased, and with increasing pole offset. Injury severity increased with pole circumference, reaching a plateau at about 40 in.

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DOT-FH-11-8501

Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p165-80

1978; 3refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 752

HS-023 767

THE EFFECT OF MANDATORY SEAT BELT LEGISLATION ON MORTALITY AND MORBIDITY IN DENMARK

The effect of Denmark's mandatory seatbelt usage legislation, enacted 1 Jan 1976, was studied by analyzing injury patterns of traffic accident victims, both users and non-users of seat belts, who were treated at Odense Univ. Hosp. since 1 Feb 1971 as well as police-reported accident data. The seatbelt legislation requires that front-seat occupants in private cars and delivery vans use seat belts. There are exemptions for taxi drivers, certain medical handicaps, persons below the height of 150 cm, and children under the age of 15. Since 1 Apr 1976, there has been a penalty of approximately \$20 for not complying with the law. The legislation brought about an initial decline in the number of traffic casualties; but this effect, in terms of both frequency and severity of injuries, disappeared in the second year of enforcement in spite of an increase in seatbelt usage from 20% to 72%. This negative effect cannot be explained by an increase in traffic or an increase in accidents. Special high-risk groups, e.g. young drivers and nighttime drivers, influence the accident statistics to a more pronounced degree than expected. These high-risk groups are substantially less affected by seatbelt enforcement than the average driving population, and need special attention. Further optimization of the restraint/vehicle/occupant system and supplementary passive protection systems are necessary. Severe lesions to internal organs were seen in about 10 cases/year and only in connection with severe car damage. The frequency of significant neck injury was about one/year.

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Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p181-91

1978; 11refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 752

HS-023 768

THE EFFECT OF MANDATORY CRASH HELMET USE FOR MOPEd RIDERS IN DENMARK

The epidemiological effect of mandatory crash-helmet (for moped/motorcycle riders) legislation in Denmark, enacted 1 Jan 1977, was studied; and existing knowledge on the biomechanical effect of helmet use was related to findings of this study. There was an increase in helmet use among moped riders from approximately 30% to 98% immediately following the legislation. An analysis was made of 3298 injured moped riders registered at Odense Univ. Hosp. from 1 Jan 1973 to 31 Dec 1977. During this period there was a significant reduction in the number of head injuries among helmet users. The proportion of victims with significant brain injuries (i.e. those with an expected period of incapacitation of more than two weeks) apparently had started to decline prior to the enactment of the law, concomitant with a slow but steady increase in helmet use. No cases of helmet-induced injuries to the neck and throat were found in the population studied. The overall distribution of injuries to the different parts of the body seems to confirm existing knowledge on the biomechanical protective effect of helmet use. It is tentatively concluded that the voluntary increase in helmet use from 1973 to 1976 actually can be traced to moped riders most likely to get involved in accidents leading to severe cranial injuries. The increased usage rate induced by the law may still be of great importance, however, by preventing a number of less serious injuries mainly among the low-risk groups.

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Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p192-202

1978; 8refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 752

HS-023 769

AN ANALYSIS OF ACCIDENTS INVOLVING BUSES AND AN ASSESSMENT OF THE NEED FOR SAFETY BELT REQUIREMENTS IN SUCH VEHICLES

A study was performed to investigate all available information pertinent to safety belts in intercity buses and to make specific recommendations as to what form a requirement for safety belts in intercity buses should take, if any such requirements are indicated, based on cost-benefit analysis. Cost-benefit analyses were conducted for each of several safety belt requirement options (lap belt vs. lap/shoulder belt, all seat locations vs. front eight seats, new buses vs. all buses), taking into consideration such factors as costs of injuries and deaths foregone, and costs of belt assemblies, and of seat, floor and structure modifications. The study approach included a detailed review of all in-depth investigation reports involving intercity buses for the years 1972-1976 available from the Bureau of Motor Carrier Safety and the National Transportation Safety Board (66 accidents studied altogether). Based on these analyses, requirements for passenger safety belts in intercity buses are not recommended. However, recommendations are made for optimizing the energy-absorbing design of seats, and for installing an energy-absorbing restraining barrier in front of the first seat units on each side of the bus. Concerning manda-

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tory seatbelt use, it was found that for lap belts at all seated positions, the cost of installing the restraints could be justified only if 80% of the passengers wear their restraints properly.

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DOT-FH-11-9180
Publ: HS-023 752, "American Association for Automotive
Medicine Conference (22nd), and International Association for
Accident and Traffic Medicine Conference (7th) Proceedings,
Vol. 2," Morton Grove, Ill., 1978 p203-15
1978; 4refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.

Availability: In HS-023 752

HS-023 770

INFLUENCE OF VEHICLE DESIGN ON PEDESTRIAN LEG INJURIES

Data from existing hospital and police records in Birmingham, England and from in-depth studies of pedestrian accidents are used to examine the influence of vehicle front-end design on pedestrian pelvic and leg injuries. The potential for improvement in vehicle front-end design is examined by considering the reduction in the number of pedestrian casualties with non-minor, nonfatal injuries that would occur if there were no pelvic or leg injuries. Leg injuries were found to be the second most frequent nonminor injury sustained (head including face being most frequent). The majority (90%) of the nonminor pelvic and leg injuries were fractures. Virtually all (99%) of the nonminor pelvic and leg injuries, where the cause of injury was known, were caused by vehicle contact. For the pelvis and legs, the bumper was responsible for over half (55%) of the vehicle contact nonminor injuries; contact with the front structure above the bumper accounted for a further 42%. The severity of the pelvic and leg injuries resulting from contact with the vehicle front structure was dependent on the impact speed of the vehicle and the age of the pedestrian. Elderly pedestrians were more susceptible to fractures for a given impact speed. The location of the bumper contact fractures was influenced by the height of the bumper with respect to the pedestrian. Knee injuries were more likely to occur when the relative bumper height (absolute bumper height divided by pedestrian height) was 0.26-0.35. Vehicles with bumpers located at a height of 50-54 cm had the highest incidence of knee injury. Lowering the bumper position appears to reduce the likelihood of fracture resulting from bumper contact. Decreasing bumper lead was associated with a decreased incidence of bumper contact fractures and an increased incidence of hood front contact fractures. The fracture threshold speed appeared to increase with decreasing bumper lead. Pelvic fractures were more likely when the relative hood height was 0.46-0.50. The elderly were particularly susceptible to pelvic fractures.

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Publ: HS-023 752, "American Association for Automotive
Medicine Conference (22nd), and International Association for
Accident and Traffic Medicine Conference (7th) Proceedings,
Vol. 2," Morton Grove, Ill., 1978 p216-36
1978; 18refs

Sponsored by Insurance Inst. for Hwy. Safety, and Transport
and Road Res. Lab. Conference held at Ann Arbor, Mich. 10-
14 Jul 1978.

Availability: In HS-023 752

HS-023 771

PEDESTRIAN HEAD INJURIES

The nature and general cause of the head injuries sustained by a sample of 211 pedestrians struck by the fronts of cars or light-duty commercial vehicles based on car designs are described. Contact with the vehicle is the main cause of serious head injuries, as opposed to contact with the ground. Contact with the windshield frame is more likely to result in serious head injury than contact with the windshield glass or top surface of the hood. If the vehicle exterior could be designed to reduce the incidence of head contacts to the relatively stiff windshield frame, a reduction in the incidence of serious head injuries could be expected. However, the actual reduction in the severity of the head injuries sustained may not be as great as expected, due to the possible masking of ground contact head injuries by vehicle contact injuries in this study. At present the location of the head contact is influenced by pedestrian height, vehicle shape, vehicle impact speed and deceleration; the distance from the front of the vehicle to the head contact increases with increasing pedestrian height, decreasing hood height, increasing impact speed, and decreasing vehicle deceleration. The introduction of compliant "pro-pedestrian" front structures designed to reduce pedestrian pelvic and leg injuries is likely to alter the location of the head contact on the vehicle, the "wrap around distance" to the head contact becoming equal to the pedestrian height as the increased friction between the compliant front structure and the pedestrian's legs reduces the "slip" between the pedestrian and the vehicle exterior to zero. A reduction in the wrap around distance to the head contact will result in fewer head contacts with the hood. The hood, therefore, should be designed to provide a tolerable head contact. This, in conjunction with pro-pedestrian compliant front structures, would result in a reduction in the number of pedestrians seriously injured and killed.

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Publ: HS-023 752, "American Association for Automotive
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Accident and Traffic Medicine Conference (7th) Proceedings,
Vol. 2," Morton Grove, Ill., 1978 p237-44
1978; 6refs

Sponsored by Transport and Road Res. Lab. Conference held
at Ann Arbor, Mich. 10-14 Jul 1978.

Availability: In HS-023 752

HS-023 772

FACIAL INJURIES FROM MOTORCYCLE ACCIDENTS

The types of soft tissue and bony facial injuries commonly seen resulting from motorcycle accidents are pictorially demonstrated, the significance of these injuries with regard to treatment is discussed, and the protection potential provided by various helmet designs is pointed out. Particular emphasis is given to a form of soft tissue injury called accidental tattoo, almost unique to motorcycle accidents, an injury characteristically consisting of road dirt deeply embedded into soft tissues, often in combination with tissue avulsion. Unless removed promptly, these particles become tissue fixed and the face is permanently tattooed. These foreign particles should be extricated within 6 to 8 hours of the injury whenever possible, and is most easily accomplished with a sterile surgical scrub brush after the patient or the region of injury has been

anesthetized. When such treatment is delayed beyond 12 hours or when the wounds have healed with these foreign particles retained, a more formalized surgical abrasion with power-driven dermabrasion equipment is indicated, but is less effective. The most significant factor in reducing the incidence and severity of facial injuries, in particular, is the use of the "full face" helmet. The American National Standards Inst.-approved, lightweight, visored helmet is commercially available and is now becoming more popular. Contrary to some of the original objections, it is well ventilated, is adjustable for comfort and retention, and maintains an unobstructed visual angle of at least 108 degrees. Furthermore, the complaint of interference with hearing has proved unfounded as the signal-to-noise ratio has been shown to remain unchanged. The polycarbonate visor not only provides wind protection for the eyes, but also protects both skin and bone, as it does not shatter on impact except from extremely high energy forces. Its special protection, however, comes from its lower cross face and increased anterior design which provides skin protection and energy absorption for the cheeks, lower face, and forehead.

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 Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p245-66
 1978; 38refs
 Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 752

HS-023 773

IMPACT OF RURAL EMERGENCY MEDICAL SERVICE SYSTEMS

A study involving four rural emergency medical service (EMS) systems in Kansas communities was undertaken to determine the feasibility of paramedic systems in small population base communities. The factors of skill deterioration and cost were measured since it is felt that these are the major reasons against establishing a paramedic system in a rural area. Each system was evaluated by number of emergency runs requiring advanced life support, the type of run, and the care given pre-hospital and in the emergency department. Skill deterioration and methods of maintaining EMT-P (emergency medical technician-paramedic) skills in such small communities were identified. The cost per capita of establishing and maintaining each system was also determined, along with the cost of lives saved in those patients with a lethal arrhythmia. The cost of lives was determined by multiplying the total cost of the system by the percentage of patients with a lethal arrhythmia and dividing this figure by the number of patients surviving a lethal arrhythmia. The time period for this portion of the study was one year. It was concluded that advanced life support systems are more expensive as the population base goes down, that there is a decrease in clinical saves from arrhythmias as the number of runs increases, and that skill deterioration is less in services with continued exposure to practicing technical skills in the hospital. In the four communities studied, the problem of skill deterioration was aggressively combated by assuring frequent remedial training in the technical skills necessary to function at an advanced life support system level. Three of the four systems were hospital-based. All four felt that this was a tremendous advantage in retaining the technical skills. Also recognized is the need for continued remedial training in the basic technical skills such as splinting and car-

diopulmonary resuscitation, and frequent review of cognitive knowledge necessary to function at the paramedic level. This was achieved by the offering of frequent in-service sessions within the advanced life support system.

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 Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p267-77
 1978
 Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 752

HS-023 774

ENGINEERING CONSIDERATIONS IN THE DESIGN OF PROTECTIVE HEADGEAR

An overview is presented of the manner by which protective headgear achieves its primary function, protection of the helmet wearer from head impact injury. How this can be best achieved within the context of the particular environment of operation of a motorcycle is discussed. Helmet design criteria, physics of impact, helmet design (outer shell, energy-absorbing liner, comfort liner, and retention system), and material options for each of the four safety helmet elements are separately considered. Human and bioengineering factors dominate geometric considerations. Not only does due attention have to be given to human impact tolerances, but also to considerations of visual clearance, anthropometry, sound attenuation, muscle fatigue, heat dissipation, general comfort and final aesthetics. Many problems in helmet design still have not been adequately dealt with and include dynamic retention of the helmet on the head, fogging or other visual disturbances of faceshields, and long-term durability.

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 Publ: HS-023 752, "American Association for Automotive Medicine Conference (22nd), and International Association for Accident and Traffic Medicine Conference (7th) Proceedings, Vol. 2," Morton Grove, Ill., 1978 p278-93
 1978; 5refs
 Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
 Availability: In HS-023 752

HS-023 775

MOPED ACCIDENTS IN SELECT SOUTHERN CALIFORNIA COMMUNITIES

Police accident investigation forms from moped collisions occurring during 1976-1977 were collected from six southern California cities and analyzed in detail to determine behavioral patterns and groups of events leading to the collisions. Upon analysis, several strong trends in accident type emerged, as well as associated vehicle and driver characteristics. Nine major accident types were identified and include the following: single-vehicle collision, right-turning vehicle from same direction collides with moped, moped collides with rear vehicle, left-turning vehicle from opposing direction collides with moped, moped/vehicle cross traffic conflict, left-turning moped collides with vehicle, moped collides with open car

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door, vehicle collides with rear of moped, and other. Two-thirds of the collisions were categorized as either a single-vehicle collision, a right-turning vehicle from same direction colliding with moped, a moped colliding with rear of vehicle, or a left-turning vehicle from opposing direction colliding with moped. The accident-involved moped driver is typically a young (16-17) male who owns his own moped. The distribution of the four major accident types is significantly affected by time of day. During normal weekday commuting periods, mopeds are more likely involved in collisions with right-turning and left-turning vehicles. Although further investigation is warranted, type of community (beach vs. inland) appears to affect the type of collisions involving mopeds. Beach community mopeds are more likely to collide with the rear of another vehicle or collide with a right-turning vehicle proceeding in the same direction. An age-sex interaction was exhibited in regard to the four major accident types. Young male moped drivers were shown to be more involved in collisions with the rear of another vehicle than were older males, and young female moped drivers were more likely to be involved in collisions with a right-turning vehicle than were older females.

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Publ: HS-023 752, "American Association for Automotive
Medicine Conference (22nd), and International Association for
Accident and Traffic Medicine Conference (7th) Proceedings,
Vol. 2," Morton Grove, Ill., 1978 p294-306
1978; 5refs
Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 752

HS-023 776

IN-SERVICE FAILURES OF HIGHWAY SAFETY SYSTEMS

The causes of in-service failure of highway barrier systems and breakaway poles are related to design detail, expected system performance, location criteria, installation specifications, and maintenance. The analysis of several real-world cases identifies the failure mechanism of the system, changes in current installation, and/or maintenance procedures that must be modified or discussed. The specific systems considered are roadside and median barriers and breakaway pole and sign supports. Each system is discussed in terms of its intended application and performance. Careful consideration must be given to the following factors in relation to the effectiveness of highway safety systems under impact conditions: performance of the system in terms of deflection and redirection, existence of vertical discontinuities in the roadside that will create unstable conditions for the vehicle as it interacts with the system, reduction of the effectiveness of system by maintenance procedures, penetration of vehicles into opposing traffic lanes during the redirection process because of dynamic performance characteristics of system, consequences of application of two or more systems working in concert, and severity of results of striking any system vs. consequences if no system in place. (A bibliography on highway safety systems is provided.)

by Wayne T. VanWagoner
Wayne T. VanWagoner and Associates, Inc., Salt Lake City,
Utah
Publ: HS-023 752, "American Association for Automotive
Medicine Conference (22nd), and International Association for

Accident and Traffic Medicine Conference (7th) Proceedings,
Vol. 2," Morton Grove, Ill., 1978 p307-34
1978; 32refs

Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 752

HS-023 777

ALCOHOL INVOLVEMENT IN ROAD CRASH CASUALTIES, VICTORIA, AUSTRALIA

The results are presented of compulsory blood alcohol estimations obtained on all road crash casualties aged 15 years and over who were treated at Victorian (Australian) hospitals since the collection and analysis of samples began in Oct 1974. Since 1966, the legal limit for blood alcohol concentration (BAC) in Victorian drivers has been 50 mg/100 ml (vs. 80 mg/100 ml for the rest of Australia). The BAC's of injured road users were compared with those of fatalities and those obtained by breath analysis. The study revealed an increasing number of traffic casualties with positive readings as well as an increasing number of readings in excess of the legal limit. The BAC was significantly higher for casualties involved in accidents in the country vs. the city. In the three years since the compulsory blood alcohol estimation for road casualties was introduced, there has been a 7.4% rise in the number of driver casualties and a 6% rise in nondriver casualties with positive BAC. There has been a 6% rise in driver casualties with BAC's in excess of the legal limit. These figures supported by breath test results indicate the magnitude of the drinking/driving problem, as well as being a measure of the serious alcohol abuse throughout Australia. During the period of this study, there was no increase in political or community activity in dealing with the drinking/driving problem. The data obtained from blood sample and breath tests can provide a useful index in the assessment of any social changes and in the evaluation of countermeasures. The data can also be used to stimulate political and community support for countermeasures, to stimulate research and action, and to support education programs on road safety, in particular, and alcohol use, in general.

by Gordon W. Trinca
Royal Australasian Coll. of Surgeons, Road Trauma Com.,
Melbourne, Vic., Australia
Publ: HS-023 752, "American Association for Automotive
Medicine Conference (22nd), and International Association for
Accident and Traffic Medicine Conference (7th) Proceedings,
Vol. 2," Morton Grove, Ill., 1978 p335-44
1978
Conference held at Ann Arbor, Mich. 10-14 Jul 1978.
Availability: In HS-023 752

HS-023 778

TRANSPORTATION RIDE QUALITY

Four papers on transportation ride quality are presented, the subjects of which are as follows: comparison of passenger-comfort models in buses, trains, and airplanes; assessment of ride quality of AIRTRANS system; effects of deceleration and rate of deceleration on live seated human subjects; and pas-

senger perceptions of the helicopter: ride-quality considerations.

by Frances R. Zwanzig, ed.
 National Acad. of Sciences, Transportation Res. Board, 2101
 Constitution Ave., N.W., Washington, D.C. 20418
 Rept. No. TRR-646; 1977; 28p refs
 Includes HS-023 779.
 Availability: TRB \$3.00

HS-023 779

EFFECTS OF DECELERATION AND RATE OF DECELERATION ON LIVE SEATED HUMAN SUBJECTS

A description is presented of the testing of seated human subjects to determine the maximum deceleration and associated rate of change of deceleration (jerk) at which the majority of potential users of automated-guideway-transit (AGT) systems will remain securely in their seats. The subjects underwent various levels of deceleration and associated jerk in an instrumented vehicle while seated normally (forward facing); sideways (turned 90 degrees counterclockwise from the direction of travel); and normally, but tilted backward (facing forward, but with the entire seat tilted 5 degrees backward). The subjects also underwent various levels of jerk (seated normally only). Two groups of subjects were chosen to represent the anthropometric extremes of potential passengers, males larger than 95% of the male population, females smaller than all but 5% of the female population. Estimates based on these tests of the maximum permissible emergency deceleration are 0.47 G for forward-facing, seated passengers and 0.41 G for side-facing, seated passengers. Tilting the entire seat assembly back 5 degrees increased the estimated maximum permissible deceleration to 0.52 G. Consequently, these data support the use of forward-facing, back-tilted seating to permit high decelerations with a low incidence of passenger dislodgement. (Obviously, backward-facing seating permits higher decelerations; however, many AGT systems operate bidirectionally, and many users prefer facing the direction of movement.)

by C. N. Abernethy; G. R. Plank; E. D. Sussman; H. H. Jacobs
 Transportation Systems Center; Dunlap and Associates
 Publ: HS-023 778 (TRR-646), "Transportation Ride Quality,"
 Washington, D.C., 1977 p12-7
 1977; 5refs

Based on research supported by Transportation Systems Center and sponsored by Urban Mass Transportation Administration.

Availability: In HS-023 778

HS-023 780

FASTENING SYSTEMS DEVELOPMENT AND TECHNOLOGY [AUTOMOTIVE INDUSTRY]

Various automatic tightening tools are described which are available from a number of manufacturers for use in automotive and other industrial fastening systems. Impact wrenches provide reasonable, consistent, repeatable torque, but have no direct control of clamping force (bolt tension). Impact wrenches should only be used in noncritical situations where torque scatter up to plus or minus 25% can be tolerated and high level verification is not important. Retorquing-type wrenches assure torque uniformity from one fastener to another in multiple-fastener joints. A limiting factor in using

these tools is the reliance on torque as a measure of tensioning. However, they are satisfactory for many applications and have a reliability of plus or minus 10% torque scatter. Design tolerances of plus or minus 15% to 20% appear to be more realistic since torque verification involves the manual torque wrench. Torque-monitored type wrenches provide a dynamic torque check indicating an accurate reading of torque-motor performance. The design of this system is based on incorporating a transducer and the associated electronics, and mating it with the retorquing-type wrench system. Torque-feedback and motor shut-down wrenches use feedback torque to signal the motor to shut down within a preset range. No direct control of clamping force is provided, but torque scatter is held within limits required for most critical joints. The objective of this system is to reduce torque scatter to plus or minus 5% or better, using the proven stall motor and monitoring transducer, coupled with a shut-down device. Turn-of-the-nut wrenches (torque/turn) feature a run-down motor that pre-torques to a seating threshold. A final-turn motor rotates the fastener through a predetermined angle in degrees of rotation. This system uses the fastener threads as a micrometer by stretching the bolt a predetermined amount corresponding to fastener tension. This method achieves direct control of clamping force in qualified joints. Fastener-tensioning wrenches are the ultimate technique for controlling clamping force. These systems utilize an integrated signal that interprets torque rate vs. degrees of rotation, relating directly to tension as it develops in the fastener, allowing the fastener to be used to its maximum capability. The fastener tensioning system can signal a bad fastener, bad mating parts or shallowly tapped holes, and can compensate for burrs, lubricants and other surface variables. A new ultrasonic system is able to measure changes in a bolt's resonant frequency due to stress-induced elongation and change in sound velocity. Improvements in rivets, the second most frequently used automotive fasteners, include a new rivet system which can compensate for many production and hole preparation variations, is readily adapted to metrication, and can reduce labor and inventory costs. The system includes a lightweight fastener placing tool capable of installing up to 1500 rivets/hr. with a minimum of operator training.

by Wesley A. Waters
 Publ: Automotive Industries v158 n10 p20-4 (Jul 1978)
 1978
 Availability: See publication

HS-023 781

FASTENED JOINT DESIGN [AUTOMOTIVE FASTENERS]

In selecting the correct type of fastener for an automotive tightening system, the criteria used are speed of installation and removal, static or dynamic loading, environmental conditions, and in-place costs. Not to be overlooked in regard to product serviceability is the need for assembly-line repair or retrofit and the user's aptness to consider serviceability a repurchase criterion. The dynamic and static loading that a fastener might encounter clearly indicates its size, form and material. High-strength bolt pre-stressing is being increasingly employed in critical structural areas of truck chassis, off-highway vehicles, agricultural and mining vehicles, and automobile chassis. The vibration levels to which a fastener is exposed can affect the friction force between the bolt head, nut and clamped surfaces. Once movement occurs between the fastener thread and the nut thread, due to vibration, the force exerted by fastener tension induces additional movement. The

ability of a fastener to resist loosening due to vibration depends on the tension that can be induced when it is installed and the resistance of the resulting clamping force to the relative movement of the assembled members; a fastener locking device may be used. The choice of material and finish of a fastener is largely dependent on operating environment; among the important factors to be kept in mind are temperature cycling, oxidation resistance, stain and corrosion resistance, resistance to stress relaxation, and the avoidance of thread seizure. The in-place cost of a fastened joint should be justified by the fastener selection and engineering analysis. Second-order factors are product design, joint preparation, fastener assembly, fastener hardware, and assembly labor.

by Wesley A. Waters

Publ: Automotive Industries v158 n10 p27-31 (Jul 1978)
1978

Availability: See publication

HS-023 782

ADHESIVES--STICKING THE SCREWS [AUTOMOTIVE FASTENERS]

Confusion still surrounds the promising aspects of sealing with adhesives, part of it resulting from the vast number of specialized products within the field. For the most part, however, anaerobic adhesives are currently in the forefront. Even with the best mechanical fastening techniques, there is actually only 20% metal-to-metal contact; the remaining 80% is space caused when the high points in both metal surfaces are fastened, leaving the remaining low points unjoined. Anaerobic adhesives fill these voids, seal the empty areas and cause a more reliable and effective joining of two parts. However, there is no threat, as once believed, that adhesives will replace conventional threaded fasteners. Adhesives are filling the requirements of thread-locking and fastening exterior trim and fascia. Epoxies are being replaced with anaerobic adhesives because of the difficulty in handling epoxies. New generation adhesives are resulting in entirely new technologies, industries, and problems. Applied manually, or by means of automatic dispensers, anaerobic adhesives self-cure rapidly upon assembly of parts. A recent development in bonding technology is the ultraviolet (UV)-curing adhesives which cure in seconds when exposed to UV light. Other major breakthroughs have been made in high-volume screen printing and stenciling application techniques, these methods being fast, economical, and assuring uniform sealing of countless assemblies from oil pumps to transmissions. Another new device, the heat gun, is used for hot-melt adhesives. An area of concern is the toxicity of the adhesives to exposed workers; this subject is currently the object of Occupational Safety and Health Administration hearings. Several anaerobic adhesives will soon be introduced for use in high-strength, high-temperature (450 degrees F, 232 degrees C) applications (e.g. under-the-hood); and new pressure-sensitive fastening tapes with high-adhesion properties are expected to take over many functions currently performed by threaded mechanical fasteners. Along with other new technologies are the vacuum and pressure impregnation sealing systems. The Adhesives and Sealants Council is currently forming a committee to create industry-wide standards for the different classes of adhesives and sealants.

by William B. Scanlon

Publ: Automotive Industries v158 n10 p37-9 (Jul 1978)
1978

Availability: See publication

HS-023 783

STATE IMPLEMENTATION PLANS TO BRING BIG CHANGES IN '79 [AIR QUALITY STANDARDS AND AUTOMOBILE EMISSIONS]

By 1 Jan 1979, 104 of the U.S.'s largest cities must report, through their state governor, to the Environmental Protection Agency (EPA) how they will attain the very low and controversial National Ambient Air Quality Standards (NAAQS's) for hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NO_x), particulate, and sulfur dioxide, by 1982. EPA is recommending that the states use both transportation and land use strategies to attain the NAAQS's, but the greatest emphasis is being placed on a reduction in car travel. The primary attainment measure apparently being recommended by EPA to the states and cities is periodic inspection and maintenance (I/M). Currently, 12 local or state jurisdictions either have or will shortly have I/M programs; another dozen or so communities are now considering such programs. EPA expects that ultimately 90 metropolitan areas, involving about half the nation's cars, will be forced to have such programs. There is controversy over how much pollution the I/M program will remove and over its cost/benefit balance. No quick emissions test providing the same results as the Federal Test Procedure yet exists; present I/M programs test only at idle and reveal only the gross emitters of HC and CO. Among the other transportation control measures being urged by EPA are the installation of retrofit emission controls for used cars, parking bans on downtown streets to speed traffic and discourage driving, creation of pedestrian walks and shopping malls on streets, construction and improvement of mass transit systems, exclusive bus lanes, encouragement of car and van pooling, building of park-and-ride lots in suburban areas, encouragement of employers to persuade employees to use mass transit, bicycles and their own feet to get to work, and the use of staggered work hours. In addition, states are being advised to set road-user charges or tolls to discourage single-occupancy cars, halt the idling of cars and trucks and take a variety of measures to improve traffic flow, urge that fleets convert to cleaner engines and cleaner fuel, and help eliminate emissions from vehicle engines that start poorly in cold weather. While the greatest objective and effect of the various State Implementation Plans (SIP's) will be drastically to reduce car travel, the SIP's will also have a real impact on the auto companies, auto suppliers, and any business that creates pollution.

by Joseph M. Callahan

Publ: Automotive Industries v158 n10 p54-7 (Jul 1978)
1978

Availability: See publication

HS-023 784

FORMULATION OF A FUZZY BEHAVIOR MODEL IN MAN-MACHINE SYSTEM [DRIVING BEHAVIOR]

A "fuzzy" driver behavior model was formulated from the fundamental standpoint of the driver's pursuit of safety. Most studies on the driving stability of motor vehicles have been performed from the standpoint of a human/machine system with special emphasis on the matching of human characteristics with those of machines. In these studies, a human is replaced by a robot composed of a linear and nonlinear element; the intellect, emotions, and volition of a human are not considered. Many accidents are caused by phenomena which cannot be explained by the stability theory of human/machine

systems. A study of driver motivation dictating driving behavior is necessary. The present "fuzzy" behavior model is proposed, taking psychological conditions into consideration. The fact that a man determines behavior in such a way as to fulfill his desires is applied in the study. To work out the model of driving behavior it was necessary to consider the driver's motivation and the evaluation factors of safety, comfort (psychological and physiological), and driving purpose (suitability). Required also was information on recognition systems (optical, auditory, bodily feeling and tactile) and operation systems (information on steering wheel operations and on acceleration and deceleration). Actual space and judged space, as well as pattern recognition, must be evaluated. To construct the model, the probability prediction of responses of an automatic vehicle, estimation of the parameters of the vehicle, and the speed of man's information processing, must all be determined. A model cannot go beyond the limits set by formulae and words, and, consequently, it is almost impossible to make an exact formulation of a man with "free will". Researchers from other disciplines could help in the future in formulating these models.

by Yoshimi Furukawa; Yasuhei Oguchi

Publ: International Association of Traffic and Safety Sciences Research v2 p86-97 (1978)

1978; 3refs

Availability: See publication

MEASUREMENT AND MANAGEMENT OF PERFORMANCE OF MAN-MACHINE SYSTEM [DEVICE FOR EVALUATING DRIVING FLUENCY]

An apparatus has been developed to measure and record the performance in the human/machine system utilizing, as indicators, three sudden movements of a vehicle, sudden acceleration (over 0.3 G), sudden deceleration (over 0.4 G), and sharp cornering (over 0.3 G), in order to establish sensitive measuring criteria for research on traffic accidents, and to organize a safe driving management system by employing these measuring criteria. The measuring device, the Safety Counter Model II, consists of a sensor section and three electromagnetic counters. It was installed in six taxicabs, and the driving behavior of drivers in each of the cabs was recorded for a distance of more than 10,000 km. From the test results, it was possible to grade the fluency of driving, as well as to point out unsafe driving practices. One driver to whom a feedback of his own unsafe driving habits was given showed a subsequent marked improvement in driving performance. This instrument will be of no practical value unless it is employed in a self-management system by drivers and daily safe driving management by operation management personnel. Research is underway to study the application of the Safety Counter in a safe driving management system.

by Takayuki Funatsu

Publ: International Association of Traffic and Safety Sciences Research v2 p74-85 (1978)

1978; 6refs

Availability: See publication

THE ECONOMIC EFFECTS OF CORROSION [METALS]

A study recently completed by the National Bureau of Standards on the economic effects of corrosion concluded that the annual cost of metallic corrosion to the U.S. economy is \$70 billion. In other terms, metallic corrosion cost the country about 4.2% of the gross national product for the study year 1975. Also of significance is the finding that about 15% of the corrosion cost, about \$10 billion, could probably be avoided by making the best possible use of available technology. In addition, the cost of corrosion to the Federal government was determined to be about 2% of the Federal budget, around \$8 billion in 1975. Corrosion costs automobile owners in the U.S. between \$6 billion and \$14 billion per year, of which \$2 billion or more could be avoided by the economical use of anticorrosion measures and improved maintenance. The complete price tag covers not only replacement of corroded parts, but also premature replacement of the whole product, treatments to prevent corrosion, use of expensive materials to resist corrosion, increased inventory size to offset corrosion losses, and time and labor associated with these measures. Subtle costs include interrupted supply of products when a plant must shut down for maintenance, and costs accruing from the irreplaceable fuel and metal resources that are wasted in combatting and compensating for corrosion. The principal expenses of corrosion in the ownership of an automobile are associated with the degradation of components made of the iron and steel which comprise approximately 80% of the weight of an auto. These costs may be separated into the following three parts: costs of built-in protection against corrosion included in the purchase price, those portions of maintenance and operating costs attributable to corrosion, and costs of premature replacement.

by Michael Baum

Publ: Dimensions/NBS v62 n6 p12-7 (Jun 1978)

1978

Availability: See publication

WYOMING TRAFFIC ACCIDENT FACTS, 1977

Statistics are tabulated for traffic accidents occurring in Wyoming during 1977; the data were compiled from reports submitted by individuals involved in accidents, investigating officers from city police departments, sheriff's offices and the Wyoming Hwy. Patrol. Estimates for accident costs were supplied by National Safety Council. Following an introduction and definition of terminology, tables (and short summaries of data) are presented on the following items: overall statistics, where accidents occur, type of vehicles, type of accidents, seatbelt usage, when accidents occur, driver and environment, drivers and casualties, teenage drivers, motorcycles, school buses, trucks, and city accidents. A spot map is provided designating sites of fatal motor vehicle accidents. In summary, for the year 1977 in Wyoming, traffic accidents increased over 1976 by 1.5%; however, the accident rate decreased 9.8%. A total of 15,434 accidents occurred on Wyoming's road system. As a result, 6951 persons were injured and 250 persons were killed. This resulted in a \$71 million economic loss.

Wyoming Hwy. Dept., Safety Improvement Section, P.O. Box 1708, Cheyenne, Wyo. 82001

1978; 58p

Availability: Corporate author \$2.00

HS-023 788

A CASE STUDY OF A TRAFFIC ACCIDENT [JAPAN]

A case study is presented of a traffic accident which occurred in Sapporo City, Japan, in the summer of 1976, involving a head-on collision between two passenger cars. This investigation, the first conducted by the IATSS (International Assoc. of Traffic and Safety Sciences) AID (Accident Investigation Drill) Proj., analyzed the accident from the viewpoint of the human/vehicle/environment system. The objectives were as follows: to observe the accident site and all consequences of the accident at the site, to reconstruct the accident (take measurements and obtain a full description of the observable conditions; investigate the daily traffic volume, flow, and environment; and investigate the involved parties with regard to personal conduct and psychological state before, during, and after the accident); and to point out problems for further study. The intersection at which the accident occurred is dilemma-producing for drivers and could be improved by surface markings, signal lights, and an improved traffic system. The two drivers were considered to be overtly and potentially dangerous, respectively.

by Y. Ikeda

Publ: International Association of Traffic and Safety Sciences Research v2 p12-28 (1978)

1978

Availability: See publication

HS-023 789

MAN'S CONTROL BEHAVIOR [HUMAN ENGINEERING, MAN/AUTOMOBILE SYSTEM]

From a human engineering point of view, human control behavior in the person/automobile system was analyzed theoretically and experimentally. In order to design a car which people can operate safely, consideration must be given to automobile dynamics, human control behavior, and the roadway environment. A human engineering design refers to the design of a system which provides maximum ease of operation for people in an organic linkage of these three factors in the person/machine environment. The mutual relationships among these factors are examined. Assuming that human control behavior is represented by differential, proportional, and integral behaviors, an analysis is made of how the variations in the controlled element affect each of these behaviors. In general, there are four control methods for the pursuit of a target: compensatory control, pursuit control, preview control, and precognitive control. The results of the study show that the differential behavior tends to appear conspicuously and the psychophysiological load tends to increase when a person tries to control an element that is difficult to control. Preview information was shown to play a valuable role, mainly in reducing time delay when humans react. Although control performance improves when preview time is long, it was shown that performance does not improve when preview time is more than approximately 0.4 sec; therefore, information more than 0.4 sec in advance is unnecessary. For example, for a car running at 120 km/h on a highway, the distance per second is approximately 33 m; thus, 0.4 sec amounts to approximately 13 m. If the driver is able to see in advance to this extent, there should be little influence on normal operation. Actually, since performance characteristics of the car (e.g. brake function) and mental factors come into play, information somewhat further in advance is necessary. With indoor experiments using au-

tomobiles as samples, it was shown that preview time of up to 0.5 sec improved control performance.

by Yoshio Hayashi

Publ: International Association of Traffic and Safety Sciences Research v2 p54-63 (1978)

1978; 17refs

Availability: See publication

HS-023 790

ROLE OF VISUAL PERCEPTION IN DRIVING

There is no doubt that visual perception is vital to traffic safety, but the idea that traffic safety depends solely on improper or proper vision is challenged. Through an analysis of data on rear-end collisions, the existence of definite patterns in traffic accidents which have been caused by error in visual perception other than those arising from defects in the driver's vision, is shown, and it is demonstrated that these types of errors have greater significance than others in traffic safety. Visual perception is not independent; it is closely related to the driver's judgment, motivation, and attitude. A driver must not only perceive the existence of an object in his path, grasp its characteristics, and its interrelation with himself, but also positively try to assess its latent existence as a hazard which cannot be seen at a given time of observation. In some instances, it is necessary to employ a positive style of perception capable of seeing "latent" vs. "apparent" movements. The main objective of driver safety education should be an active development of the psychological process that lies between visual perception and the action of the driver, since 80% of accidents have been entirely due to delayed perception, regardless of reaction time.

by Yasuhisa Nagayama

Publ: International Association of Traffic and Safety Sciences Research v2 p64-73 (1978)

1978; 24refs

Availability: See publication

HS-023 791

VARIOUS PROBLEMS INVOLVED IN BICYCLE TRAFFIC. A SIDE VIEW OF TRAFFIC PLANNING

A historical review of bicycle traffic in Japan is followed by a discussion of the various aspects of and problems related to bicycle traffic, specific issues involved in traffic planning with respect to the bicycle, and the significance and necessity of introducing a bicycle traffic safety system which will place emphasis on special bicycle roads and parking facilities. Around 1971, the bicycle rapidly regained popularity in Japan for various reasons including ecology consciousness, continued high rate of economic growth, demand for a new mode of transportation as a result of the expansion of cities (access to railroad stations, shopping centers, etc.), and increased motor vehicle traffic congestion. The characteristics of bicycle traffic and use in various regions of Japan are outlined. The desirable characteristics of bicycles include their ease in operation and parking, little or no adverse effect on the environment, little consumption of resources, and utility for recreational purposes. The problems involved in the use of a bicycle include incomplete segregation of the bicycle from automobile traffic, bicycle traffic control at intersections, bicycle accidents involving pedestrians, traffic accidents involving bicycles, parking problems, and problems such as difficulty in

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operating on slopes and in foul weather. The bicycle traffic system in overall traffic planning is discussed from the standpoints of the bicycle as one means of urban transportation, basic concepts in bicycle traffic planning, planning for bicycle roads and parking facilities, and bicycles for recreation. Some areas requiring future attention are discussed and include the relationship between the use of the bicycle and pedestrian traffic, the bicycle as an alternative to the bus, the conflict between pedestrians and bicycle users, bicycle traffic rules, and incorporation of a bicycle traffic system in "newtowns" (public housing projects).

by Hitoshi Yamakawa
Publ: International Association of Traffic and Safety Sciences
Research v2 p108-18 (1978)
1978; 8refs
Availability: See publication

HS-023 792

CHILDREN AS OBSERVED IN TRAFFIC ACCIDENTS

The involvement of children under school age in traffic accidents is discussed, based on a review of the literature. Particular emphasis is placed on the problem in Japan. An analysis is presented of the causes of these accidents from the viewpoint of children's psychological and behavioral traits, such as accident proneness, tunnel vision, psychological scars of accidents, age, sex, personality, order of birth, time of day, week or year, location and injury pattern. The importance of traffic safety education for children is emphasized. Safety education for small children should be considered the first step of a lifelong education in the subject. This education should not be passive, merely intended to protect children from traffic accidents; rather, it should be aimed at having children participate in the promotion of their own safety.

by Yoshiyuki Okamoto
Publ: International Association of Traffic and Safety Sciences
Research v2 p119-26 (1978)
1978; 33refs
Availability: See publication

HS-023 793

REVISED STATISTICAL REPORT FORMS FOR TRAFFIC ACCIDENTS AND FINDINGS OBTAINED FROM DATA IN NEW SURVEY CATEGORIES

Since 1975, the National Police Agency, Japan, has been gathering and analyzing traffic accident data obtained through completely revised Traffic Accident Statistical Report Forms. The essential elements of the revisions and the returns compiled from the data gathered by use of the new report forms are discussed. While the old original report consisted of three forms (i.e. main form, accident processing classification form (recorded penal processing for involved parties), and supplementary form (recorded parties other than two direct parties)), the main form was divided in the new report into a uniform survey categories form applicable to all accidents and a follow-up survey categories form for fatal accidents, in order to record more detailed data about serious accidents. While survey categories were not systematically arranged in the old report forms, they are arranged in the new forms in the order of inspection and processing of accidents on the spot so that the forms can be filled out quickly and accurately. The new forms are so formulated that necessary data can be obtained not only

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on road environment and the nature of the accident as in the old forms, but also on the traffic environment, people, cars, damages, first-aid measures, etc. "Causes" are included in the new report forms in which such accident factors as road environment, vehicles, and people, are to be specifically indicated. The returns from these new forms have indicated, among other things, that road conditions account for 17% of contributive causes of all fatal traffic accidents, vehicles for 2%, drivers for 63%, and bicycles and pedestrians for 18%. The National Police Agency, which places high expectations on the effective use of the results of this new method of traffic accident analysis, plans to make the data readily available to interested people and organizations.

by Rokuo Matsumoto
Publ: International Association of Traffic and Safety Sciences
Research v2 p127-41 (1978)
1978
Availability: See publication

HS-023 794

PEDESTRIAN SAFETY: THE ROLE OF RESEARCH

In 1975, a combined OECD-ECMT (Organisation for Economic Co-operation and Development-European Committee of Ministers of Transport) group on pedestrian safety research was set up to study research needs in the field of pedestrian safety in relation to the policy orientation defined by the ECMT and other responsible international bodies. The Special Research Group is concentrating on the following priority areas for international cooperative research: technical improvements to the pedestrian's road environment (pedestrian crossings - location, form, signs, signals, markings, lighting, etc.); road safety education; and information and education campaigns by the mass media on the theme of pedestrian safety. The influence of alcohol in pedestrian accidents and the question of vehicle design for greater pedestrian safety, were excluded from the work of this group but are receiving attention under other international programs. Current international activities which link research more closely to policy formulation in the pedestrian safety field show promise of improving the effectiveness of international endeavors. Greater prominence needs to be given to pedestrian safety in the planning and redevelopment of urban areas. There is a continuing need to clarify the shape and significance of the various legislative frameworks that apply in different countries because these may profoundly affect the general suitability and success of individual safety measures that have been successful in some countries. Above all there is a need to carry out rigorous scientific assessments (in terms of accidents and casualties) of the benefits of new pedestrian safety measures as they are applied. Most of the pedestrian safety research to date which has taken place in well-developed countries is applicable to less well-developed countries as well. There are, however, some important differences that emphasize the need for local pedestrian safety research.

by H. Taylor
Transport and Road Res. Lab., Safety Dept., Crowthorne, Berks., England
Rept. No. TRRL-SR-319; 1977; 38p 36refs
Presented at World Conference on Transport Res., Rotterdam, 26-28 Apr 1977.
Availability: Corporate author

HS-023 795

INCIDENT DETECTION EXPERIMENTS ON THE BOULEVARD PERIPHERIQUE IN PARIS

To assist with a study into methods of detecting traffic incidents, such as accidents, breakdowns, or congestion, a number of simulated incidents were staged on the Boulevard Peripherique in Paris by the Institut de Recherche des Transports, and incident data were recorded by the Transport and Road Res. Lab. Methods of detecting interruptions in the traffic flow on roadways are being studied as part of a research program to improve traffic control on high-speed roads. In typical methods, a number of traffic parameters, e.g. speed, flow, and occupancy, are calculated continuously from data supplied by vehicle detectors. Algorithms are then used to determine whether changes in these parameters are consistent with the normal variations in traffic patterns or whether they could be attributed to an incident. The basic requirements are a reliable indication of all incidents and a low rate of false alarms. Traffic data must be obtained before and during incidents so that algorithms for interpreting disturbances in traffic behavior can be developed and tested. An analysis of the data collected confirmed that a simple algorithm using single exponential smoothing of occupancy values with a calibrated threshold is not a satisfactory way of detecting incidents. An algorithm based on the detection of slow-moving or stationary vehicles to initiate the incident alarm was able to detect all the simulated incidents without giving any false alarms. This algorithm included special features for maintaining the alarm condition during subsequent stop-go congestion and for signaling the end of the incident. Further testing is necessary in a wider range of traffic conditions. The use of a pattern recognition technique to measure journey times, which could then be monitored as a way to detect incidents, did not work at flows higher than 1,500 vehicles/h/lane.

by J. F. Collins
 Transport and Road Res. Lab., Hwy. Traffic Div.,
 Crowthorne, Berks., England
 Rept. No. TRRL-SR-362; 1977; 24p
 Availability: Corporate author

HS-023 796

BRAKE SYSTEM DEFECTS IN CARS NOT INVOLVED IN ACCIDENTS

One thousand cars in use on the roads and 100 cars in junk yards were examined for brake system defects by Automotive Products Ltd., in order to indicate the extent of defects occurring in different components of the brake systems and the factors contributing to the number of defects. Of the 1000 automobiles, 28% had one or more wheels considered to be out of adjustment or to have inoperative adjusters, and 40% had other defects (over 50% of cars averaging three or more defects). None of the 584 cars given a performance test, however, failed to reach the legal minimum requirement for service brake of 50% g. Age, mileage, and periodic servicing were among the factors which appeared to affect the number of defects, although frequency of periodic servicing did not appear significant. The results of this survey and that of a sample of cars involved in accidents suggest that the 3% of accidents which have been attributed to braking defects were mostly deviation or loss of control when braking and probably arose from wheel assembly faults. It is also likely that the number of accidents involving failure to stop in time was greatly underestimated. More benefit would be expected from a reduc-

tion in impact speeds in many accidents than an elimination of loss of control resulting from poor braking. The legally required standard of service brake performance can be achieved by cars with several serious brake defects. Increasing the peak deceleration required to 70% g (achieved by 95% of the present survey sample) would increase the defect detection rate of worn and oil-contaminated linings and pads. The introduction of roller brake test machines for the annual test will assist in detecting defects causing lateral out-of-balance braking. With 28% of the cars having had defective brake adjustment, checking this at the annual inspection could be considered. Adjustment should be made easier and adjusters more reliable in operation. The frequency of defects in brake wheel assemblies may be best reduced by wheel design which makes it simple for owners and service engineers to check conditions inside the wheel assemblies and to replace components. However, it would also be necessary to require further checking of performance or condition if the defect rate were to be reduced. The alternative course of action possibly more worthwhile in the long run, would be to build braking systems with a longer full performance life. In this survey, hydraulic leaks occurred mainly in wheel cylinder and piston seals; drum brakes should be designed so that leaks drain away from the friction surfaces. The only action required for pipes, hoses, and brake fluid is to determine at what state water content of the fluid can become dangerous.

by R. N. Kemp
 Transport and Road Res. Lab., Vehicle Safety Div.,
 Crowthorne, Berks., England
 Rept. No. TRRL-LR-803; 1977; 23p 4refs
 Availability: Corporate author

HS-023 797

A COMPARATIVE ANALYSIS OF RESULTS FROM THREE RECENT NON-SEPARATED CONCURRENT-FLOW HIGH OCCUPANCY FREEWAY LANE PROJECTS: BOSTON, SANTA MONICA AND MIAMI. FINAL REPORT

Results are compared from three recent nonseparated concurrent-flow high occupancy freeway lane projects, Boston's Southeast Expressway, the Santa Monica Freeway in Los Angeles, and Miami's I-95. The project sites and projects are described and contrasted. The following issue areas are explored: supply (changes in travel times on the freeways, changes in transit level of service), demand (modal shift to carpooling and transit induced by the reserved lane); project costs (capital and operating, including express bus costs); safety and enforcement (changes in accidents and incidents, violation rates, enforcement); and institutions and attitudes (the public's attitude towards the reserved lane concept, the effect of advertising and media reports, the role of politics). The three projects met with differing degrees of success, and those in Boston and Los Angeles have been terminated. Carpooling increased by about 70% at the three sites and travel times for those using the reserved lanes decreased. However, the projects revealed the following weaknesses in the concept: the large number of violators and the difficulty of enforcement; the potential for accidents; the inability of the reserved lanes by themselves to attract large numbers of new bus riders and carpoolers; and the political problems associated with removing an already existing lane from general use. The evidence indicated that there should be a median strip between the two directions of flow, a permanent barrier between the

reserved and regular lanes, and a limited number of reserved lane access points.

by Howard J. Simkowitz
 Transportation Systems Center, Kendall Square, Cambridge, Mass. 02142
 Rept. No. UMTA-MA-06-0049-78-2; DOT-TSC-UMTA-78-22; 1978; 52p 11refs
 Rept. for Mar 1976-Apr 1978. Sponsored by Urban Mass Transportation Administration. Service and Methods Demonstration Prog.; UMTA/TSC Proj. Evaluation Series.
 Availability: NTIS

HS-023 798

SOUTHEAST EXPRESSWAY HIGH OCCUPANCY VEHICLE LANE EVALUATION REPORT. FINAL REPORT [BOSTON, MASSACHUSETTS]

The project development, implementation, operations, and impacts are discussed of a nonseparated concurrent-flow lane instituted on Boston's Southeast Expressway on 4 May 1977. An eight-mile section of the left-most inbound lane was reserved for buses and carpools of three or more persons between the hours of 6:30 A.M. and 9:30 A.M. There were no official intermediate points of access or egress; removable plastic inserts were used to separate the lane from the other northbound lanes; compliance was voluntary until 17 Oct 1977. Construction on a portion of the roadway began in Jun 1977, reducing capacity at that point by about 25%. Consideration is given to the following impacts: travel times on the expressway and alternate routes; transportation system use patterns; cost of express lane operation; violations, enforcement, and safety; and institutions and attitudes. By the end of the project, the expressway was carrying 8% fewer people while the number of automobiles had declined 16%, reflecting a 71% increase in the number of carpools. Bus ridership increased by only 5% to 6% while ridership on rapid rail increased by 12%. Travel times were lower during the summer months for all expressway users, but during the enforcement period an average trip in the general lanes took 7.5 minutes longer. The violation rate fell from 80% to 35% when enforcement was initiated.

by Howard Simkowitz
 Transportation Systems Center, Kendall Square, Cambridge, Mass. 02142
 Rept. No. UMTA-MA-06-0049-78-4; DOT-TSC-UMTA-78-25; 1978; 75p 5refs
 Rept. for May-Nov 1977. Sponsored by Urban Mass Transportation Administration. Service and Methods Demonstration Prog.; UMTA/TSC Proj. Evaluation Series.
 Availability: NTIS

HS-023 799

THE RESTRAINT OF THE AUTOMOBILE IN AMERICAN RESIDENTIAL NEIGHBORHOODS. FINAL REPORT

Two techniques for restraining the use of the automobile in residential neighborhoods are reviewed, residential parking permit programs and traffic restraint devices. Residential parking permit program topics include: cause of the residential neighborhood parking problem, the problem's effects on the neighborhood and its residents, and the potential solutions; the residential parking permit concept as one solution (implementation, boundary problems, visitor permits, the relationship to rapid rail stations, and legal decisions); summary of

parking policies in 40 communities; and parking permit program case studies for Cambridge, Mass., San Francisco, Calif., and Washington, D.C. Despite the problems of the definition and treatment of boundaries, the issuance of visitor permits, and the adverse impacts on rapid transit and shopping accessibility, resident parking permit programs have become popular means of restraining the use of the automobile in residential areas. The existing programs have been successful in accomplishing their stated goals: parking made available to local residents, nonresident traffic reduced, and neighborhood environment improved. Topics related to traffic restraint devices include the problem of through traffic and its negative effects on a residential neighborhood; traffic restraint devices as a short-term solution and issues related to their implementation and effectiveness; the use of traffic restraint devices in communities; and case studies for Berkeley, Calif. and Seattle, Wash. Most of the neighborhood traffic restraint schemes have occurred in relatively less dense cities with a grid street pattern and sufficient reserve street capacity to accommodate the diverted traffic without causing serious congestion. The projects relied on local initiative by the affected neighborhoods.

by Howard Simkowitz; Lajos Heder; Edward Barber
 Transportation Systems Center, Kendall Square, Cambridge, Mass. 02142; Moore Heder Architects, 806 Massachusetts Ave., Cambridge, Mass. 02139
 DOT-TSC-1405
 Rept. No. UMTA-MA-06-0049-78-3; DOT-TSC-UMTA-78-24; 1978; 73p 17refs
 Rept. for 1971-1978. Sponsored by Urban Mass Transportation Administration. Service and Methods Demonstration Prog.; UMTA/TSC Proj. Evaluation Series.
 Availability: NTIS

HS-023 800

THE ENIGMA OF THE PRESENT EVIDENCE ON DRINKING-DRIVING IN NORWAY

Some facts from various investigations on the blood alcohol levels (BAL's) of drivers in Norway show a discrepancy regarding the country's drinking-driving situation. Roadside alcohol surveys conducted in Oslo in May and Jun 1970 and Jun 1971 between 10 P.M. and 2 A.M. showed that 2.8% of 1927 drivers screened were under the influence of alcohol, a 2.0% had a BAL exceeding the statutory limit of 50 mg/100 blood. The results of this first of such studies in Norway were encouraging. It was felt that Norway's very restrictive countermeasures against alcohol, 21 days' imprisonment and suspension of driver's license for drivers found guilty of driving under the influence of alcohol (DUI), could set a good example. In a repetition of this study in May and Jun 1977, when drivers were screened using Alcohol Screening Devices (ASD), the majority of drivers had a rather low ASD value, the maximum being 1.41 per mille. However, in a 1973 study 45.9% of a group of 74 injured drivers from traffic accidents in Oslo had a higher BAL than the statutory limit, while among a group of 204 non-accident motor vehicle drivers, only 3.4% had ingested alcohol before driving. In another study conducted in 1972 and 1973, of 168 injured motor vehicle drivers 44.6% were found to be DUI. These studies indicate that, in general, the Norwegian anti-alcohol legislation has a deterrent effect, i.e. minimizing the alcohol involvement of the non-accident driving population. On the other hand, the legislation seems to have a very weak impact on drinking prior to driving among accident-involved drivers, who have an alarmingly high frequency of alcohol involvement. This discrepancy is not

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easily accounted for; and the need for more thorough, intensive, and, if possible, continuous research is emphasized. The alcohol problem among Norwegian drivers cannot be solved by legislative or punitive measures alone, but by adequate police enforcement and adjustment of corrective measures based on scientific data.

by Olav Bo
Publ: Journal of Traffic Medicine v6 n1 p10-2 (Mar 1978)
1978; 13refs
Availability: See publication

HS-023 801

MOTOR TRAFFIC IN SWEDEN 1977

Statistical tables on motor vehicles in Sweden for 1976 (and comparison years) are provided. Tables (and accompanying narrative summaries) are presented on the following subjects: motor vehicles in use, new registrations, production,exports/imports, motor vehicle taxes, road networks, miscellaneous statistics (life expectancy of passenger cars, fuel consumption, number of fatal accidents, number of tons carried by truck, number of holders of driver's licenses for passenger cars), and international surveys. A subject index is provided. Preceding the tabulations is a paper entitled "The Passenger Car Market 1977-1985" by Lars Jacobson, which discusses the numerical development of new car sales and the passenger car population up to 1985.

Association of Swedish Automobile Manufacturers and Wholesalers, A. B. Bilstatistik, Storgatan 19, Box 5514, S-114 85 Stockholm, Sweden
1977; 91p refs
Availability: Corporate author

HS-023 802

A ROAD SIGN FOR WARNING OF CLOSE-FOLLOWING: FORM AND MESSAGE DESIGN

The opinions of 100 randomly selected drivers on six designs for a close following warning road sign were obtained by presenting a film simulating the operation of each design. Design 1 is a secret sign (blank unless activated) which when activated shows two images. One image refers to the rear of a car and gives the message "Too Close"; the other image gives the instruction "Move Apart" and presents the required action pictorially. Images alternate between "Too Close" and "Move Apart" six times in periods of 0.75 second for each image, starting and ending with "Too Close". The switching is intended to give an impression of increasing the following gap and also draws the driver's attention to the message. Design 2 has a permanently visible symbolic image which is intended to remind drivers of their following distance. When activated, the words "Too Close" appear and indicate the driver's following distance. An arrow flashes to draw the driver's attention to the sign and flashes twice a second for five seconds while the words "Too Close" are displayed. Design 3 is a secret sign with the verbal message "Following Too Closely" displayed for five seconds when activated. Amber lights flash vertically in pairs with each pair flashing once a second to attract the driver's attention. Design 4 has a verbal message in which the words "Following Too Closely...When Flashing" are displayed permanently. Drivers are reminded of the following distances when they see the sign. When the sign is activated, the word "Danger" appears in red and flashes seven times during five

seconds. This design is thought to be too 'wordy', but it was included in the study because it is presently used in the U.S. Design 5 has a permanent symbolic message display of two cars as seen from the side on a blue background. A double-headed amber arrow between the two cars acts as a reminder of following distance. The amber arrow flashes twice a second for five seconds to attract attention to the message, and the words "Following Too Closely" appear when the sign is activated. Design 6 is a secret sign with a message in two parts, the first stating "Too Close", the second giving the instruction "Move Apart". The words are in amber and alternate between the two parts, each being displayed for 0.6 seconds. There are eight changes during the presentation with the initial and final messages reading "Too Close". An assessment of the participants' questionnaires showed that, although no particular design was outstanding, two designs (3 and 6, in that order) were generally acceptable.

by Alec Robertson
Transport and Road Res. Lab., Road User Characteristics Div., Crowthorne, Berks., England
Rept. No. TRRL-SR-324; 1977; 21p 12refs
Availability: Corporate author

HS-023 803

TOWARDS A NEW BRITISH MOTORCYCLE

Based on six years of research on motorcycle engineering, with particular emphasis on handling and primary safety, a strategy is proposed for reestablishing the British motorcycle industry. To improve motorcycle stability, a leading-link fork has been designed and constructed which is three times as stiff as the best telescopic fork, and five times better than the one it replaced. This has been achieved quite simply and cheaply, without sacrificing suspension quality or incurring a weight penalty. In fact, suspension action is better than the spragging of the telescopic fork. By fitting the leading-link fork to several modern "superbikes", front-wheel flutter has been eliminated and high-speed weave dramatically reduced, even under heavy loading conditions. Complete stability has been achieved by additional frame modifications. A prototype automatic valve-timing unit has been developed which changes valve-lift characteristics, and thus torque and emission performance, as a function of engine speed and load. Ways of improving the traditional drum brake have been studied, and further improvements in braking have been achieved by the use of the leading-link fork, since this arrangement offers the advantage of "anti-dive" braking. The compression of the front suspension under heavy braking can be controlled to the desired amount by very simple changes to the brake linkage geometry. Silencing formed a major part of the research, resulting in development of the now well-known "annular-discharge" exhaust silencers, in which exhaust gas passes down the narrow annular passage between two concentric cylinders. The central volume is then tuned with Helmholtz cavities. The annular passage absorbs sound over a wide frequency range in the double boundary layer on the passage walls. The cavity also acts as a resonance length, as with conventional silencers. With careful choice of annulus diameter and height, these silencers have a lower back pressure than the conventional multiple-expansion-box units, and they give excellent performance characteristics. With this background of research and with consideration of economics, an initial development is suggested for a 500 cu cm, single-cylinder, four-stroke motorcycle, later doubled up, using many common parts, to a 1,000 cu cm V-twin. Four-valve cylinder heads,

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now well researched in the U.K., would be used. To rebuild the British motorcycle industry would be a long, difficult operation, with its realization doubtful in the near future, but the technology exists.

by G. E. Roc; T. E. Thorpe
Publ: Engineering p708-10 (Jul 1978)
1978; 7refs
Availability: See publication

HS-023 804

GASOHOL: ENERGY MOUNTAIN OR MOLEHILL?

"Gasohol", a blend of 90% unleaded gasoline and 10% ethanol, has become one of the most highly controversial energy issues in the U.S. "Gasoholics" claim that gasohol will alleviate the oil import problem on one hand while solving the farm problem on the other (producing the ethanol from surplus grain). Others are certain that gasohol has neither the economic muscle nor the Btu's to accomplish any of these things. These skeptics cite that on a cost-per-Btu basis, ethanol runs about five times higher than gasoline, and that it is too expensive to use as a fuel as long as less expensive fossil fuels still exist. The opponents also state that since it takes more energy to produce ethanol than can be gotten from it, gasohol will increase U.S. demand for foreign oil. Different alcohols (ethanol vs. methanol), different sources (e.g. grains, cellulosic biomass, wood, coal), different blend ratios, or even 100% alcohol fuel, all contribute to the confusion that exists. The focal point of the economic, energy, and political furor is gasohol as a blend of unleaded gasoline and grain-derived ethanol. When farm interests are combined with energy interests, such as oil companies, and political interests are added, controversy is probably inevitable. The major issue is not whether gasohol will work; the debate is whether it will be worth the effort.

by Earl V. Anderson
Publ: Chemical and Engineering News v56 n31 p8-12, 15 (31 Jul 1978)
1978; 3refs
Availability: See publication

HS-023 805

OFFICIAL SUPPORT FOR A GASOLINE SUBSTITUTE GROWS... "GASOHOL" MAY BE THE ANSWER

One of the most promising substitutes for gasoline now under consideration is "gasohol", a mixture of gasoline and alcohol. The alcohol most available in large quantities is methanol, usable as a car propellant without gasoline. Hydrogen or natural gas has also been considered as a gas substitute, but a blend of gasoline and methanol now has priority. No automobile engine adjustments would be required for the use of the 10% blend of methanol and gasoline, according to automotive experts. Only minor alterations would be needed to convert most auto engines to 100% methanol fuel. California scientists were among the first in the U.S. to point to the important role that methanol could play in solving a gasoline shortage, since it can be made from garbage or various kinds of industrial waste, which California has in abundance. Methanol can also be made from coal, natural gas, and wood. Since it can be produced from so many solid wastes, including old auto tires, it is hailed by its advocates as a virtual "gold mine" for cheap fuel. Sena-

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tors from farm states are among its strongest supporters; they see it as a way to utilize profitably the nation's grain surplus. Despite the lack of enthusiasm being shown by the Carter administration for methanol production, more than 20 Senators have indicated they will support a legislative program of that kind. Keenly aware of California's need for a clean-burning gasoline substitute or additive and the need to reduce oil imports, Senator Alan Cranston has become a strong advocate of methanol testing. Meanwhile the scientific evidence supporting the use of methanol continues to grow.

by William L. Roper
Publ: California Highway Patrolman v42 n6 p8-9, 45, 48 9, 52-3 (Aug 1978)
1978; 1ref
Availability: See publication

HS-023 806

TURBOCHARGING AND TURBOCHARGERS

Developments in automotive turbocharged engines, both gasoline- and diesel-powered, are outlined, based on presentations at the 18-20 Apr 1978 conference of the Institution of Mechanical Engineers held in London. The chairman of the conference's planning panel pointed out that BMEP's (brake mean effective pressure) in automotive turbocharged engines were much lower than with larger units, owing to the problems of providing adequate torque back-up and a match at low speeds that did not result in excessive smoke emission, but that with many new systems under development, rapid progress is expected. Included in the discussion are variable geometry turbines, compound turbocharging, Hyperbar, Comprex, the turbocharged Wankel, turbocharger matching, performance predictions, and developments in turbines and compressors. While the emphasis with very large engines is to increase the efficiency of turbochargers around the rated speed, with automotive units the need is for a wide spread of power, resulting in lower efficiencies. For this reason, the Comprex offers advantages in some applications; this unit, developed by Brown Boveri of Baden, Switzerland, provides a method of transferring the exhaust energy directly to the air being delivered to the cylinder. Variable geometry or two-stage turbocharging has a future. Perhaps the use of a wastegate, a bypass for the turbine that limits turbine inlet pressure, offers the most short-term potential, although simpler designs are needed. The conference demonstrated a tremendous interest in turbocharging for all types of automotive engines, and indicated that the use of turbochargers in the 1980's will lead to a completely different breed of engine, much smaller and lighter than those used today, and with more torque back-up.

by John Hartley
Publ: Automotive Engineer v3 n3 p17-20 (Jun-Jul 1978)
1978
Availability: See publication

HS-023 807

FEEDBACK AND DOWNDRAFT [CARBURETORS]

The Zenith Carburetor Co. is nearing finalization of two major carburetor modifications: an automatic feedback (or closed loop) modulation system for the precise control of air-fuel ratio (AFR), and a downdraft-type constant-vacuum (DCV) carburetor. The feedback system can be applied to either the existing CD carburetor or to the new down-draft

equipment. At a small performance sacrifice, the carburetor modifications are more cost-effective than fuel injection. A similar system has been developed in the USA by Holley/Ford, in response to strict limitation of carbon monoxide (CO) and nitrogen oxides (NO_x) in automobile emissions of 1980's vehicles, and to fuel economy requirements. In the automatic feedback system, feedback information is provided by a zirconium dioxide sensor, precisely placed in the exhaust manifold of a vehicle, with dual modulation to achieve optimum control of air/fuel ratio (AFR) over a wide range of altitude and temperature conditions. The AFR is corrected by "weakening-off" rather than by enriching, as a fail-safe device. The control system is a combination of an electronic processor and an electromagnetic modulator, with an engine speed signal to be introduced later. The modulator is based on two solenoid assemblies, one for bypass correction and one for jet-well bleed. Zenith is confident that this feedback system with the three-way catalyst, will meet all anticipated 1980-81 emission standards, as well as California's extremely stringent NO_x limitation if limited exhaust gas recirculation (EGR) is used. In the DCV, a spring-loaded air valve is mounted on an offset spindle linked to the fuel-metering needle. Fuel delivery characteristics can be modified as usual, with an additional adjustment for tension of the air-valve control spring. A compounded idling system has been adopted to compensate for fuel viscosity variation with temperature. Special provision can be made for automatic transmission or air conditioning.

by Alan Baker
 Publ: Automotive Engineer v3 n3 p25-7 (Jun-Jul 1978)
 1978; 1ref
 Availability: See publication

HS-023 808

ENGINE DESIGN SERIES: GASKETS AND SEALS

The most critical seal in an engine is the one between the cylinder block and head. The cylinder head structure is rarely rigid enough to allow the use of a simple seal, yet the gasket must prevent leakage of the hot compressed gases, water, and oil; it should compress to a predetermined thickness with a low tolerance; and, when once installed, should not require that the bolts be retightened. Similarly, the rear crankshaft seal operates under particularly difficult conditions. The gas loads deflect the crankshaft webs so that the rear journal tends to nod, and the eccentric motion is accentuated by the outboard location of the seal. There is substantial flow of oil thrown at the seal from the bearing, and drainage holes are usually inadequate to take all the oil away. In extreme conditions, the chamber between the journal and seal can become pressurized. To overcome the drainage problem, the seal housing should be separate from the bearing cap to provide greater drainage area. Since pressures are generally low in the less critical joints in an engine, most of these seals present few problems, although it is important to recognize that air leaks can upset the emission levels of an engine if they happen to be connected to the induction system in any way. One interesting trend is the use of silicone rubber and other materials as formed-in-place (FIP) gaskets. Gasket materials include crimped and laminated steel, copper-asbestos-copper, reinforced compressed asbestos, and perforated steel coated with rubber-asbestos. For very high specific outputs, the Wills gas-filled rings are used as a fire seal, although high cost limits their use to racing engines. Silicone, polyacrylic, or fluorocarbon rubber is used for crankshaft seals because of high operating temperatures. For less critical joint seals, a wide range of

material is used, from paper to thick cork. A controlled swell gasket material, such as Richard Klinger's 2CA (laminated to cork), is used to seal sump joints.

by John Hartley
 Publ: Automotive Engineer v3 n3 p40-2 (Jun-Jul 1978)
 1978
 See also HS-022 659.
 Availability: See publication

HS-023 809

EFFECT OF STEERING GEOMETRY ON SELF-CENTERING TORQUE AND "FEEL" DURING LOW-SPEED MANOEUVRES

Results that can be achieved by various degrees of correction for geometry varying between parallel steer and full Ackerman are described, using theoretical and experimental data. There is an increasing tendency in modern vehicles for the steering geometry to display an almost "parallel steer" characteristic. In extreme cases, at high lock angles and low speeds, this characteristic may result in a loss of self-centering torque or even the steering winding itself on to lock. Ackerman theory states that each front wheel of a vehicle should be steered in such a manner as to negotiate a curve along its natural rolling path. Thus, in the case of a conventional four-wheeled vehicle the inner front wheel, which is describing an arc of smaller radius than the outer wheel, should be steered through a greater angle than the outer wheel. However, at speeds in excess of 8 km/h (5 mile/h), for example, the slip angles at which the tires must run to produce the required cornering force will become significant. The slip angles of the rear wheels have the effect of moving the center of turn forward and thus decreasing the required differential in steered angles to allow the front wheels to follow a rolling path; this would also be the differential for the front wheels to have equal slip angles. In the extreme conditions of negotiating a large-radius curve at high speed in an oversteering mode, the steered angles will be small and the slip angles, particularly at the rear, will be large. It is then possible that the center of turn would move ahead of the front axle line and so require a differential of steered angles opposite to that used for Ackerman. If a geometry displaying near to "parallel steer" characteristics is used to satisfy high-speed requirements, then at low speeds and high lock angles there will be considerable conflict between the natural rolling path and the steered path. The conflict is increased by the trend towards wide-section tires with high-cornering stiffness. The increase in wheel offset necessary to accommodate extra tire width can produce negative self-centering torque at the steering wheel at high lock angles, resulting in unpleasant "feel" during low-speed maneuvering. The divergence in geometry from parallel steer necessary to provide good low-speed feel is, however, small. The few degrees of correction required at large lock angles will result in insignificant differentials at the small lock angles associated with high-speed cornering for which parallel steering is favored.

by S. Pitts; A. W. Wildig
 Publ: Automotive Engineer v3 n3 p45-8 (Jun-Jul 1978)
 1978
 Availability: See publication

HS-023 810

INFLUENCE OF KING PIN INCLINATION ON STEERING EFFORT

The geometric factors applicable to a steerable road wheel system utilizing large king pin inclinations, which have an adverse effect on steering effort and efficiency, are explained. It is an accepted fact that a steerable road wheel carried on a king pin with an inclination and positive ground offset produces vertical displacement of the vehicle, referred to as lift, as the wheel turns around the king pin axis. What is not generally accepted is that zero ground offset of the king pin center line to the wheel vertical center line still produces a vehicle lift proportional to the amount of king pin inclination. Also, the general inference, that a negative offset of the king pin to the wheel should produce vehicle drop, is not true. It can be proved that any steerable system with king pin inclination and a positive, zero, or negative ground offset will produce vehicle lift. A reduction in the king pin angle will have a substantial beneficial effect on the amount of effort required to turn the wheel around its king pin axis. Other considerations affecting steering effort include effects of the tire contact area on the work done to deflect the tire elements or to distort tire walls due to changing camber created by wheel swivelling. These conditions vary with vehicle speed and weight transference during swivelling, and could in some cases require additional steering effort. Factors influencing steered wheel recovery include the geometric conditions of the suspension system (castor angle and energy stored in the repositioned and deflected tire position during swivelling).

by G. D. Bashford

Publ: Automotive Engineer v3 n3 p49-50 (Jun-Jul 1978)
1978

Availability: See publication

HS-023 811

CONSUMER COMPLAINT NO. 1: AUTO REPAIRS

The National Hwy. Traffic Safety Administration (NHTSA) estimates that auto repair fraud costs American consumers \$2 billion a year, which is only a small part of the approximately \$20 billion consumers waste on auto repairs each year (about 40 cents of every consumer dollar spent for auto repair). The vast majority of responses to a questionnaire sent to consumer agencies by the Senate Consumer Subcommittee stated that auto repair problems were the number one area of complaint. The Dept. of Transportation's (DOT) Office of Public and Consumer Affairs states that comprehensive programs for auto repair problems are needed. In California and Michigan, bureaus have been set up to deal specifically with such problems. Both charge registration fees for shops doing auto repair work and use the money to finance their operations. Both have power to suspend or revoke these registrations if the states' laws and regulations are not met, and both have set up a hotline for consumer complaints. Michigan requires that mechanics periodically pass state certification requirements. California's Bureau of Automotive Repair also sets up and runs undercover fraud investigations, then turns over evidence to prosecutors. Programs in both states have widespread consumer support. Other elements of a comprehensive program include the following: disclosure laws (typically provide for a written estimate and require the shop to stay within a certain percentage (e.g. 10%) of that estimate); competent diagnosis of the problem by someone other than shop doing the repair (e.g. auto clubs); arbitration programs; accountability (e.g. registra-

tion of auto repair shops); definition of deceptive practices and means to improve the level of mechanic competence.

Publ: Transportation USA v4 n4 p20-3 (Summer 1978)
1978

Availability: See publication

HS-023 812

DESIGN OF A CURRENT TECHNOLOGY ELECTRIC VEHICLE

As part of the Energy Res. and Devel. Administration (ERDA) program to develop totally new, improved-performance electric vehicles by 1979, the rationale used General Electric (and Triad Services, Inc. as subcontractor) designing a 4-passenger electric vehicle for urban use, the Current Technology Vehicle, is presented, and the vehicle design, the drive train, and the control are described. The approach taken was to utilize current technology (1976) in the basic design, to design to meet the FMVSS (Federal Motor Vehicle Safety Standard) requirements, to identify the upgrading technology by trade-off analysis, and to predict the improvements by upgrading performance with selected advanced technologies available by mid 1978.

by R. H. Guess; W. R. Nial; M. A. Pocabello
Publ: Electric Vehicle News v6 n4 p9-14 (Nov 1977)
1977

Presented at Intersociety Energy Conversion Engineering Conference, Washington, D.C., 1 Sep 1977. Research sponsored by Energy Res. and Devel. Administration.
Availability: See publication

HS-023 813

INSTITUTIONAL FACTORS AFFECTING EV USAGE EXCERPTS OF A SPECIAL REPORT PREPARED FOR THE DOE [ELECTRIC VEHICLES VS. INTERNAL COMBUSTION ENGINE VEHICLES; DEPARTMENT OF ENERGY]

An analysis is presented of institutional biases toward vehicles of particular characteristics and their influence on U.S. surface transportation systems. The primary focus is on biases for against electric and hybrid vehicles as compared with conventional internal combustion engine (ICE) vehicles. The major U.S. societal institutions clearly reflect a transportation-oriented society in which the ICE vehicle predominates. Institutions appropriate to conventional vehicles, however, may create biases against alternative vehicle systems with significantly different characteristics. In this study, an analytical structure and methodology were developed to define and evaluate institutional factors and their potential impact on particular vehicle characteristics. The following principal categories of institutional factors are considered: taxes and regulations, traffic control, urban design, electricity supply, Federal policies and programs, automotive industry structure and practices, and miscellaneous. Areas of impact at which bias might occur were classified in terms of the life of automotive vehicles (manufacture and distribution, purchase, and ownership and operation). A matrix was developed in which 60 individual factors were classified and subjected to analysis. Of these, 11 lead to bias against electric and hybrid vehicles (EHV's), 14 show no bias, 14 cause bias in favor of EHV's, and 4 are unclear. Major sources of bias against EHV's are limits on current and intermediate technology (safety standards, tax-

speed laws, and highway design), and lack of reliable information.

Publ: Electric Vehicle News v7 n2 p10-4 (May 1978)
1978

At head of title: EVs vs ICES.
Availability: See publication

HS-023 814

A LOOK DOWN THE ROAD, BEYOND 2000. A SCENARIO OF BATTERY ELECTRIC VEHICLE MARKET EVOLUTION

A technology impact assessment of electric vehicles (EV's) was performed by SRI International (formerly Stanford Res. Inst.) for the Dept. of Energy (DOE). The assessment considers vehicles that use batteries to store all their needed energy, and hybrid vehicles which have a small gasoline-powered engine to extend their range when necessary. A scenario is presented of the manufacture, sale, and use of EV's extending in phases from the present to the early 21st century, and featuring the changing character of EV manufacture and the effects of foreign (Japanese) competition. Impacts were identified and analyzed on all major groups with an interest in EV's: owners, manufacturers, the government, insurance companies, financial markets, etc., in order to articulate public policy options that can enhance the benefits or ameliorate the adverse effects of EV use. A (modified) econometric model developed by the Electric Power Res. Inst. was used to derive the limits of the potential market for battery/electric vehicles that meet performance and cost characteristics described by the General Res. Corp. The scenario was developed from an examination of the attitudes, business perceptions, and lead times for the key stakeholders in the EV supply market, beginning with passenger cars and later accounting for sales of delivery vans and other light truck fleet vehicles. Mileposts in the scenario include the DOE EV demonstration program (1978-85), development of nickel-zinc (Ni-Zn) batteries, "advanced" lead-acid batteries, and high-temperature batteries (1981-84), and time-of-day pricing of electricity (1982). By 1985, there will be successful research in lithium-sulfur and sodium-sulfur batteries, and by 1995, the first US electric car assembly line will be in operation, with all cars using high-temperature batteries. Beyond 2000, the EV market, leveled off at 10-15% of total vehicle sales, will be equally shared by high-temperature and Ni-Zn batteries.

by Edward M. Dickson; Barry L. Walton
Publ: Electric Vehicle News v7 n2 p27-9 (May 1978)

1978
Presented at Dept. of Energy Contractor's Coordination Meeting (1st).
Availability: See publication

HS-023 815

U.S. DEPARTMENT OF TRANSPORTATION ANNUAL REPORT (NO. 10) FISCAL YEAR 1976

This Dept. of Transportation (DOT) annual report covers activities for both fiscal year 1976 (1 Jul 1975 through 30 Jun 1976) and the transition quarter (1 Jul 1976 through 30 Sep 1976). A summary is provided of a few of DOT's FY 1976 activities, followed by more detailed accounts of these and other departmental activities in progress reports for the various DOT agencies (Office of the Secretary, Coast Guard, Federal Avia-

tion Administration (FAA), Federal Hwy. Administration (FHWA), Federal Railroad Administration (FRA), National Hwy. Traffic Safety Administration (NHTSA), Urban Mass Transportation Administration (UMTA), Saint Lawrence Seaway Devel. Corp., and the Materials Transportation Bureau (MTB)). An appendix contains statistical tables and graphs. Topics covered in the report include transportation policy, international air carrier policy, economic regulation, tunneling, noise abatement regulations, environmental impacts, and consumer affairs. Transportation modes include maritime activities, aviation, highways, railroads, urban transportation, and materials transportation (pipelines and hazardous materials).

Department of Transportation, Washington, D.C. 20590
Rept. No. AR-10, 1978; 103p

Availability: GPO, Stock No. 050-000-00137-7

HS-023 816

BACKGROUND MANUAL ON THE OCCUPANT RESTRAINT ISSUE

Documentation on the subject of restraint systems for automobile occupants is presented. Various issues of "Status Report" (Insurance Inst. for Hwy. Safety), press releases, letters, statistics from NHTSA (National Hwy. Traffic Safety Administration) reports, and newspaper articles are provided under the following headings: the Dept. of Transportation's passive restraint order, air bags and passive belts: two passive approaches, endorsements of passive restraint mandate, most of the injured aren't vehicle purchasers, public opinion, and active belts. Included is a chronology of passive restraint developments from 1952 through Feb 1978.

Insurance Inst. for Hwy. Safety, Communications Dept., Watergate 600, Washington, D.C. 20037
1978; 112p refs

Availability: Corporate author

HS-023 817

AERODYNAMIC AND REPAIRABILITY CONSIDERATIONS IN TRUCK CAB AND BUS BODY DESIGN

In the designing of truck cabs and bus bodies, first-time cost may dictate one design route, while aerodynamic efficiency or ease of service and maintainability could lead to other approaches. The detailed engineering design can and does have an appreciable effect upon operating economics. The aerodynamics of truck cabs and the accident repair of cabs and bus bodies are considered to illustrate these points. The main factors affected by the vehicle's aerodynamic characteristics are operating cost, vehicle safety, and the performance of other systems. The first factor is essentially aimed at reducing drag and thus fuel requirements; the safety aspect is centered around driver vision, which can be severely limited by dirty windows and mirrors. Data are presented which were obtained from a 1/8-scale wind tunnel model. The test work covered designs that showed a wide range of drag coefficients, 0.52 to 1.08. Cab design relating to both overall form and detail design in critical areas, and load/vehicle configuration are the two main factors that determine the drag force. Aerodynamic design should achieve a drag coefficient of as low as 0.62 for the tractor with an air flow that is attached over the roof and most of the cab sides. This represents a substantial improvement over existing designs

which should have a significant effect on overall fuel consumption. The following radii should be specified to ensure the general form of the cab is acceptable (leading edges free from sharp discontinuities): roof, 250 mm; front panel, 200 mm; and upper 'A' post, 80 mm. The vehicle design should incorporate a roof deflector for use with high loads; a front air dam can reduce drag. The flow conditions required for low drag, coupled with further development of the spray-generating problem, lead to significant gains in visibility in wet conditions. For minor accidents, relatively small changes to the design concept can show significant advantages with respect to repairability. Damage to the front quarter panel and lower door frame occurs with such frequency that simple repair should be possible. Damage must be confined to the panel itself and should not affect fundamental structures such as the 'A' post. This can be achieved by providing a nonstructural outer skin panel with the 'A' post subframe "buried" below it; the same principles should be applied to the remaining front structure. To affect a cost saving in the repair of extensively damaged bodies will require a total repair system designed into the body structural concept, as is the case with the Leyland National bus.

by W. T. Lowe
Publ: Transport Engineer p19, 22-3 (May 1977)

1977

Availability: See publication

SENSITIVITY OF DRIVER-VEHICLE PERFORMANCE TO VEHICLE CHARACTERISTICS REVEALED IN OPEN-LOOP TESTS

The literature is reviewed related to research on the relationship between closed-loop task performance and driver subjective opinion, and various steady-state and transient characteristics revealed in open-loop tests of vehicles. The advantages of being able to objectively specify desirable vehicle handling characteristics, which can be determined without recourse to closed-loop tests on a prototype vehicle, are widely recognized. Although there has been considerable activity in closed-loop evaluation of vehicle characteristics, no clear measure of agreement has been reached which would justify the setting of mandatory performance requirements. In the field of vehicle handling, for example, identification and specification of good handling qualities involve design, stability, response, and system parameters, as well as task and mission performance. Of these factors, the last two involve intervention by the driver in closed-loop evaluation tests, the results depending on driver skill and adaptability. Interactions between vehicle characteristics preclude the specification of single optimum values for such factors as yaw damping and steady state gains on preferred response time. The most important vehicle characteristics for normal driving appear to be the steady-state response gain, the time lag between steering and response, and the damping of directional response. Indicators are emerging on basic requirements for steering control sensitivity, and the rapidity and stability of the fixed-control dynamic response of vehicles in normal maneuvers. Data are lacking for the closed-loop effects of vehicle sideslipping, free-control responses, and vehicle behavior in limit maneuvers.

by M. C. Good
Publ: Vehicle System Dynamics v6 p245-77 (Oct 1977)
1977; 79refs
Availability: See publication

HANDLING CHARACTERISTICS OF CAR-TRAILER SYSTEMS: A STATE-OF-THE-ART SURVEY

A review of the literature is presented on car-trailer system handling characteristics, including the very limited research on passenger cars towing trailers, and the much larger body of work on car-trailer systems. Topics included are aerodynamic forces, tire forces, the compliance concept, relevant work on vehicles without trailers, vehicles with trailers, and the role of the driver. The types of stability problems exhibited by car-trailer systems are discussed. The state of the art of the ability to predict vehicle response to specific steering inputs is shown to be fairly advanced. Recent significant advances include the appearance of experimental data useful for validating theoretical models. However, the state of the art of defining desirable handling characteristics is still at a primitive stage, largely because of a lack of understanding of the roles played by drivers as part of the vehicle-driver-environment system. Opportunities for significant future contributions to the state of the art lie in the following areas: continued development of tire models to improve the ability to relate tire properties to tire performance and to improve understanding of how tire forces are generated; development of methods for predicting transient aerodynamic forces occurring when vehicles encounter gusts; continued study of steady-state turning, particularly in relation to trailer vehicles; improvement of the understanding of the conditions under which trailer vehicles can jackknife; and clarification of the role of the driver, and development of specific criteria for desirable handling characteristics.

by Edward F. Kurtz, Jr.; Ronald J. Anderson
Publ: Vehicle System Dynamics v6 p217-43 (Oct 1977)
1977; 181refs
Availability: See publication

SUOMEN TIELIJKENNEONNETTOMUDET, VUONNA 1976 (ROAD TRAFFIC ACCIDENTS IN FINLAND 1976)

This 22nd in a series of compilations of Finnish traffic accident statistics presents data on road accidents in 1976 as well as some time series of accidents for the years 1957-1976. The data were tabulated from traffic accident reports submitted by the police to the Central Statistical Office. Traffic accident costs have been excluded in this year's report. One table provides statistical data on traffic accidents in some European countries in 1975.

Central Organization for Traffic Safety, Liikenneturva,
Finland
1977; 37p
Text in Finnish and English. Additional figures from 1957.
Availability: Corporate author

MOTOR VEHICLE INSPECTION: ITS TIME IS NOW

The Highway Safety Act of 1966 mandated Periodic Motor Vehicle Inspection (PMVI) programs in each state, but PMVI has not received the attention and direction it deserves. President Carter's energy message contained no new PMVI

directives, and the Clean Air Act establishing automotive emission levels mandates inspection and maintenance of vehicles for emissions only in the 25 cities now in violation of national ambient air quality standards. PMVI offers the following benefits: reduction in gasoline demand in the U.S. by almost 5%; savings of nearly 5 billion gallons of gasoline per year; savings of thousands of lives each year; creation of about 200,000 jobs; promotion of longer vehicle life; reduction of about \$5 billion a year in pollution costs; and reduction in repair bills. The reasons for the lack of success of the nationwide inspection program mandated in 1966 include such things as "benign neglect" by the Nixon Administration, consumer distrust, and poorly-drafted legislation establishing the program. Another factor is that the loss of 10% of Highway Trust Fund money for noncompliance with the PMVI program never was enforced by the Dept. of Transportation (DOT). Many state programs were hastily established, and there was little accumulated knowledge on which to base safety checks. As a result, from a high of 34 states two years ago, there are currently 29 states with PMVI programs. Under the Clean Air Act, safety aspects of PMVI are to be enforced by the National Hwy. Traffic Safety Administration, and emission standards enforced by the Environmental Protection Agency. These two agencies have joined forces in at least one auto inspection project, the recently initiated Gas Savers Check, which has widespread support among parts and equipment manufacturers, after-market associations, and consumer groups. The voluntary program is designed to provide free emission checks to evaluate a car's emission compliance and gas efficiency level. In order to obtain public support, the PMVI program needs encouragement from the White House or Congress.

by Robert Hickox
Publ: Motor Service p20, 25-7 34, 37 (Sep 1977)
1977
Availability: See publication

HS-023 822

CARTER'S "HUMANITARIANISM" ALTERS TRUCK SAFETY

During the Nixon and Ford administrations, much of the Dept. of Transportation's (DOT) fleet safety regulations were aimed at upgrading equipment, but the Carter administration is geared toward a humanistic approach. Improving the truck driver's working environment, coupled with eliminating the major causes of typical driver ailments, puts a new focus on truck safety. The National Hwy. Traffic Safety Administration (NHTSA) administrator, Joan Claybrook, says her agency will continue to monitor field experience of Federally-mandated braking systems (Federal Motor Vehicle Safety Standard (FMVSS) 121), will be looking at the crashworthiness of trucks, and will continue to focus on occupational restraints, the area with the greatest payoff in terms of reducing deaths and injuries. The Bureau of Motor Carrier Safety (BMCS), the agency responsible for developing and enforcing Federal motor carrier safety rules, will be getting increasingly involved in driver safety and health vs. accident prevention. With the Occupational Safety and Health Administration and safety activists at the Professional Drivers Council (PROD) at its heels, the BMCS is paying more attention to driver working areas. Cab size is an issue of particular concern; certain truck cabs are dangerous and uncomfortable because the driver does not have adequate room, but there is some question as to whether BMCS has authority to regulate cab dimensions. BMCS is also

working on a crash underride standard, with rulemaking expected before the end of the year, and a standard to bring BMCS regulations in conformance with FMVSS 121 (air brakes). Additionally, the bureau plans to beef up its own compliance program. NHTSA's Claybrook says that cost-benefit analysis will continue in major proceedings but the results will not be a controlling factor in safety rulemaking. Ms. Claybrook thinks that NHTSA can help solve the greatest safety problem, the impaired driver, by improving the efficiency of the drivers' registry, possibly by computerization.

by Jean Strickland
Publ: Commercial Car Journal v133 n6 p78-87 (Aug 1977)
1977

Availability: See publication

HS-802 300

OFFICE OF STATISTICS AND ANALYSIS PLANS FOR A NATIONAL ACCIDENT SAMPLING SYSTEM

The National Hwy. Traffic Safety Administration's (NHTSA) National Accident Sampling System (NASS) is discussed in terms of its analytic objectives, criteria that it must satisfy to accomplish objectives, its proposed structure and schedule of implementation, and its impact upon the future of accident research. The purpose of NASS would be to provide the accident data which are required to accomplish the primary mission of NHTSA which is to reduce the number of fatalities, injuries, and economic losses resulting from motor vehicle accidents. It would provide detailed, reliable, accurate data on crash events for identifying national problem areas, evaluating highway safety standards, designing and evaluating countermeasures, comparing alternative designs of vehicles, and in general, improving the nation's accident situation. While the final design has not been determined, it is likely that somewhere between 25 and 45 teams will be needed in order to collect nationally representative data. It has been suggested that approximately 500 Level Two cases be randomly selected annually for investigation by each of the teams. Level Two implies that the investigation will be based primarily on police and doctor's reports, short telephone interviews with drivers, brief inspections of vehicles, and occasional on-site visits after the accident. There will be little or no in-depth requirements such as found in Multidisciplinary Accident Investigation (MDAI). An important aspect of the NASS structure involves its integration with the Fatal Accident Reporting System (FARS) and the National Accident Reporting System (NARS). The present plans are for NASS to become operational by 1 Jan 1980.

by Charles J. Kahane; Scott N. Lee; David R. Morganstein
National Hwy. Traffic Safety Administration, Washington,
D.C. 20590
1977; 10p 3refs
Presented at Motor Vehicle Collision Investigation
Symposium, Buffalo, 6 Oct 1975. For Proceedings, Vol. 1, see
HS-801 979.
Availability: Reference copy only

HS-802 976

COMMUNICATIONS MANUAL. ADDENDUM 1 TO HIGHWAY SAFETY PROGRAM MANUAL VOL. 2

This manual is designed to complement Appendix P, Communications Planning for Emergency Medical Services, which

provides directions for those concerned with defining system boundaries, organizing system providers, and integrating these into a comprehensive and workable communications system. This manual provides guidance for the system designer/implanter concerned with the operational and technical definition of the system. Information is presented in the following chapters: the purpose of communications in emergency medical services (EMS), the evolution of specialized EMS communications, elements of communication in the EMS service, EMS communications and the role of the Federal Communications Commission--the common system, implementing the EMS communications system, radio equipment and techniques for EMS communications, required technical characteristics of EMS communications facilities in a common-user system, and supporting communications systems. For organizational reasons, one element of the system, Citizens Band Radio as an input element, is dealt with separately in a companion manual (National Emergency Aid Radio (NEAR) Manual).

National Hwy. Traffic Safety Administration, Washington, D.C. 20590
1978; 74p
Availability: GPO

HS-803 025

MOTORHOME AND PICKUP CAMPER SAFETY

Information on the proper care and operation of the recreational vehicle is presented in the following sections: basic rules for safe operation of a motorhome or pickup camper, matching a slide-in camper to a pickup truck, truck-camper loading, weighing a motorhome, loading plan, maintenance, fires and explosions, exhaust system, miscellaneous safety tips, and fuel conservation. A glossary is included.

National Hwy. Traffic Safety Administration, Washington, D.C. 20590
1978; 19p
Availability: Corporate author

HS-803 186

MOTORCYCLES. FATAL ACCIDENT REPORTING SYSTEM. SPECIAL REPORT ON MOTORCYCLES

Statistical information pertinent to an examination of fatal motorcycle accidents in the U.S. in 1976 is presented in one of a series of reports presenting a special analysis of data collected through the National Hwy. Traffic Safety Administration's (NHTSA) Fatal Accident Reporting System (FARS). Motorcycle registration statistics and state laws have been compared with the FARS data to provide a more complete picture of the fatalities associated with motorcycle accidents. In summary, important statistics are as follows: increase in motorcycle registrations from under 1% of total registered vehicles to 3 1/2% during the past 25 years; involvement of motorcycles in 8% of all fatal accidents; occurrence of 3/4 of all fatal motorcycle accidents in the 6-month period Apr through Sep; occurrence of 92% of all single-vehicle fatal motorcycle accidents in good weather; occurrence of more than 1/2 of fatal motorcycle accidents each day between 4 P.M. and midnight; more likely involvement of motorcycles in a single-vehicle fatal accident than passenger cars; collision with another vehicle in over 1/2 of all fatal motorcycle accidents; motorcycle struck in front in almost 3/4 of fatal motorcycle accidents; urban intersections

and rural nonjunction areas most frequent sites of fatal motorcycle accidents; occurrence of 50% of single-vehicle fatal motorcycle accidents on curved highways; alcohol more of a factor in single-vehicle motorcycle accidents than in multiple-vehicle accidents; 69% of female motorcyclist fatalities under 25 years old; one in four motorcycle drivers involved in fatal accidents without a valid license; and increases in fatalities in all except two (Alaska and Arizona) of the eight states that repealed their helmet laws in 1976.

by Kathy Pappas Jatras
National Hwy. Traffic Safety Administration, National Center for Statistics and Analysis, Washington, D.C. 20590
1978; 75p
Availability: GPO, Stock No. 050-003-00304-2

HS-803 273

SAFETY RELATED RECALL CAMPAIGNS FOR MOTOR VEHICLES AND MOTOR VEHICLE EQUIPMENT, INCLUDING TIRES. DETAILED REPORTS FROM JULY 1, 1977 TO SEPTEMBER 30, 1977

Detailed information is presented regarding defect recall campaigns conducted by domestic and foreign automobile and equipment and tire manufacturers during the third quarter of 1977. Postal vans, transit coaches, automobiles, tree-cutting equipment, bus fuel-tank straps, motor homes, trucks, trailers, tractors, aluminum front-wheel hubs, haulsters, campers, fire trucks, motorcycles, mopeds, motorcycle helmets, cruise controls, anti-skid systems, engine speed controls, motorcycle backrests, aluminum hubs, and tires are included. Correspondence between the National Hwy. Traffic Safety Administration and the companies involved is reproduced, as is other relevant correspondence such as letters to dealers and customers.

National Hwy. Traffic Safety Administration, Washington, D.C. 20590
1978; 766p
Availability: NTIS

HS-803 350

REVIEW OF CHEST DEFLECTION MEASUREMENT TECHNIQUES AND TRANSDUCERS. FINAL REPORT

The following techniques and transducers are evaluated for their potential for use with dummies, cadavers, infrahuman primates, and living humans: optical techniques (high-speed motion pictures), accelerometers (piezoelectric accelerometers, piezoresistive accelerometers), potentiometric techniques, inductive techniques (near-field induction, eddy current losses, variable reluctance), capacitive techniques, ultrasonic techniques (reflection ultrasound, transmission ultrasound) and digital output (tranducers). Measurement requirements are summarized, inherent problems are pointed out, and recommendations for the solution of some of these problems and further investigation are given. The measurement of chest deflection with anthropomorphic dummies should be a relatively easy task using commercially available displacement transducers. When using cadavers and infrahuman primates the task may be accomplished reliably in well-controlled laboratory experiments using photogrammetric techniques, but it is considerably more difficult in field tests with restraint systems. The measurement of chest deflection with living hu

great deal more study to establish their value.

by Gordon R. Plank
Rept. No. DOT-TSC-NHTSA-78-33; 1978; 38p 24refs
Rept. for Sep 1976-May 1977.
Availability: NTIS

HS-803 361

EXECUTIVE SUMMARY OF FIVE ALCOHOL SAFETY ACTION PROJECTS' JUDICIAL SYSTEMS

A summary is presented of results of studies conducted at five sites where researchers believed that the Alcohol Safety Action Proj. (ASAP) had brought about major changes in the judicial system or had developed innovative approaches to the adjudication of drinking-driving cases (Puerto Rico; Idaho; Hennepin County, Minn.; Phoenix, Ariz.; and Los Angeles, Calif.). On the basis of these five individual studies and experience in other jurisdictions, the study team developed a series of hypotheses about court systems and the way they process DWI (driving while intoxicated) cases. The most important of these hypotheses are stated as policy considerations for improving DWI case processing in other courts. Legislation alone is not enough to bring about change in judicial systems. The full range of statutory penalties is applied rarely, making some penalties irrelevant except in terms of general deterrence. Law enforcement officials usually do not suspend or revoke licenses if they believe that a license is necessary for the defendant to work. Few trials actually take place, but the threat of trial and the right to trial do much to determine what happens in the court system. There is no evidence that lay judges are any less proficient in handling drinking-driving cases than legally trained judges. A major problem is that law enforcement record systems fail to indicate that a person has been arrested or convicted for a previous drinking-driving offense. Increased arrest rates force courts to establish routines to process DWI cases and may therefore be a major factor in improving court procedures. Court procedures for drinking-driving cases may be routinized and standardized to the point where much of the two crucial judicial functions, adjudication and sentencing, can be done by persons other than judges. Almost anyone in the court system can classify defendants into drinker types; only very limited training is necessary. Finally, the monitoring of referrals, and follow-up to determine compliance with court dispositions, are often major weaknesses in the referral systems developed by ASAP. The study team concluded that ASAP's have helped courts improve their methods for dealing with DWI offenders, but more needs to be known about courts and the relationship of judicial actions to highway safety. Four major recommendations to the Dept. of Transportation are as follows: continue to sponsor work to determine how courts should handle DWI cases in view of current social and medical theories of alcoholism, develop a national policy toward DWI offenses, based on professional knowledge, develop standards on judicial processing of DWI cases, and develop model drinking-driving legislation.

National Hwy. Traffic Safety Administration, Washington, D.C. 20590
1978; 13p
See also vols. 1-5, HS-803 468--HS-803 472.
Availability: NTIS

TRAINING

This bibliography represents literature acquired since the establishment of the National Highway Traffic Safety Administration (NHTSA) as related to manpower development in the field of highway safety. It is comprised of NHTSA contract reports, reports of other organizations concerned with highway safety, and articles from periodicals in related fields. Citations follow the format used in the monthly abstract journal, Highway Safety Literature, and are indexed by a keyword-out-of-context (KWOC) listing, author, corporate author, contract number, and report number. Documents listed herein may be examined in the Technical Reference Branch, NHTSA. Availability is given in the individual citations.

by William E. Tarrants, comp.; Lois Flynn, comp.
National Hwy. Traffic Safety Administration, Technical Reference Div., Washington, D.C. 20590
Rept. No. SB-29; 1978; 208p
Rept. covers HSL Jan 1967-Mar 1977.
Availability: NTIS

HS-803 383

EXEMPLARY PROGRAMS INVOLVING THE USE OF SCHOOL BUSES. FINAL REPORT

The results of an in-depth field study of pupil transportation safety programs in 12 selected U.S. jurisdictions to identify exemplary activities involving the use of school buses are reported. The participating pupil transportation systems are as follows: Beaverton School District No. 48 (Oreg.), Cal Coast Charter, Inc. (Oxnard, Calif.), Clark County School District (Las Vegas, Nev.), Fort Worth Independent School District (Tex.), Memphis City Schools (Tenn.), Minneapolis Public Schools (Minn.), Napa Valley Unified School District (Calif.), Special School District of St. Louis County (Mo.), United Truck and Bus Service (Providence, R.I.), Van Der Aa Bus Lines, Inc. (South Holland, Ill.), Volusia County Schools (Fla.), and Weld County School District No. 6, Greeley (Colo.). Forty-three detailed descriptions of exemplary activities using school buses are presented, based on the criteria of safety/efficiency, innovation, and replicability. Exemplary activities which enhance the character and quality of pupil transportation safety programs are grouped in the following ten categories: driver training, field trips, pupil instruction, special education, public relations, maintenance, record-keeping, community services, safety techniques, and administration. This document is a resource for current information on pupil transportation programs and the innovative use of school buses, and will be useful to state and local administrators of pupil transportation departments across the country. As a resource, it will encourage states and communities to improve in all areas of safe pupil transportation.

by Joseph P. Miller
Lawrence Johnson and Associates, Inc., 2001 S St., N.W., Suite 502, Washington, D.C. 20009
DOT-HS-7-01618
Rept. No. PB-283 403; 1978; 148p
Rept. for 10 May 1977-9 Feb 1978.
Availability: NTIS

HS-803 399

AUTOMOTIVE RADAR RESEARCH. FINAL REPORT

An investigation of the interference effect of automotive radar brake sensors operating in the 60 GHz vicinity with satellite communication systems and radio astronomy activity is described; also, the results of a study on an experimental baseband radar system, which was built (by Sperry Corporate Res. Center, Sudbury, Mass.) as a prototype braking sensor, are discussed. It appears that radar brake sensors operating in the 60 GHz vicinity will not cause significant interference with satellite communication systems operating at those frequencies, because of the attenuation caused by the resonance of molecular oxygen. The 60 GHz region is also relatively free of radio astronomy activity, so that interference with passive radio astronomical observations should be minimal. Furthermore, it has been emphasized that the cost of microwave components produced in large quantity is governed ultimately by the amount of material involved in fabrication. Thus, given equivalent technologies, a 60 GHz device could be made more cheaply than could a similar 10 GHz system. It is concluded that the baseband radar approach is an attractive alternative to an RF (radio frequency) system. This is not to say, however, that RF systems should be rejected. In fact, it is felt strongly that funding should be allocated for the development of a prototype short-pulse (on the order of 10 ns) RF automotive radar. Such a device could be built without undue sophistication and apparently at reasonable cost. The baseband system development should continue in a parallel fashion. It has been shown that it is indeed possible to narrow the coverage of baseband systems to a roadway lane width at ranges of 150 ft to 200 ft (45 m to 60 m), and it is clear that velocity sensing can be easily implemented with a range-gated receiver. This development should be completed, and on-road testing of a baseband system interfaced to vehicular brakes should be instituted perhaps on a test fleet of automobiles. Similar testing of a suitably developed pulsed RF system is also in order. Only by performance tests at the levels indicated above can the ultimate questions of driver acceptance and observed on-road detection and false alarm performance be answered. Appended are tables providing summaries of frequencies being monitored for radio astronomy observations (by state and observatory), and a complete description of the Sperry baseband radar braking system.

by Richard A. Chandler

Department of Commerce, Inst. for Telecommunication Sciences, Boulder, Colo. 80302

DOT-HS-6-01375

1977; 58p 5refs

Rept. for 1 Jun 1976-15 Aug 1977.

Availability: NTIS

HS-803 400

STUDY OF SELF TEST DEVICES. FINAL REPORT [QUANTITATIVE BREATH ALCOHOL MEASUREMENT DEVICE]

A study was conducted to determine whether individuals might change their drinking-driving behavior if they were aware of their intoxication level and its implications for accident involvement, and the legal consequences. The study was implemented at public and private drinking situations in Fairfield County, Conn., from Dec 1975 through May 1976. Individuals who were about to leave those situations voluntarily participated in a presentation of drinking-driving information,

using verbal and graphic material, following which they were tested on a portable, quantitative breath alcohol measurement device. Upon leaving, these individuals were observed and interviewed to determine their transportation mode and relevant background, demographic, and situational data, as well as the impact of the information presentation on their transportation decision. Observations/interviews also were conducted of individuals who elected not to participate in the presentations as well as of individuals at comparable (control) situations where no presentations were made. Analyses of the observation/interview data disclosed that individuals who participated in the information presentation were not significantly more likely to refrain from driving while under the influence of alcohol than were individuals who were not exposed to the information. Neither was there evidence that exposure to the information led to moderation of drinking on subsequent occasions. Furthermore, these analyses showed that the impact of transportation and drinking behavior was not affected by the availability of public transportation or by repeated exposure to the information presentation. It is concluded that the presentation of intoxication levels and related information, as implemented in this study, does not undesirably affect drinking-driving behavior. Consideration should be given to conducting a self-test experiment accompanied by a mass media education campaign. Consideration might also be given to replicating the reported study without restricted access to the self-test device persons who would be able to determine their BAC's (blood alcohol concentrations) at an earlier point might be encouraged to cease drinking at that time. Appendices provide description of commercial sites and selection procedures for private parties, the text of information presentation, and the questionnaire used.

by John F. Oates, Jr.

Dunlap and Associates, Inc., Darien, Conn. 06820

DOT-HS-5-01241

1976; 120p 9refs

Rept. for Jul 1975-Jul 1976.

Availability: NTIS

HS-803 401

SEMINARS FOR PROBATION-DIAGNOSIS-REFERRAL PERSONNEL IN ALCOHOL-HIGHWAY SAFETY PROGRAMS. FINAL REPORT

Eight short-term seminars were conducted during 1976 to train approximately 15-25 alcohol countermeasures personnel involved in alcohol-highway safety programs. The training package, "Seminar in Alcohol and Highway Safety: Probation Diagnosis, Referral and Rehabilitation," which was previously developed by Indiana University for the National Hwy. Traf. Safety Administration (NHTSA), was employed to train local alcohol-highway safety program personnel in the techniques and procedures for investigating, referring, and controlling drinking drivers according to the nature of their drink problems. The seminar was provided with reasonable success at the following sites: Kansas City, Mo.; Phoenix, Ariz.; Sacramento, Calif.; Salt Lake City, Utah; Illinois; Memphis, Tenn.; NHTSA Region X (Boise, Idaho); and Mississippi. I

February 28, 1979

HS-803 442

objectives, impact, unique features, and participants for each seminar are presented.

by Gary J. Scrimgeour; James A. Palmer; R. Jeffrey Ripberger
Indiana Univ., Inst. for Res. in Public Safety, 400 E. Seventh
St., Bloomington, Ind. 47401
DOT-HS-5-01219
1977; 71p
Rept. for Jun 1975-Dec 1976.
Availability: NTIS

HS-803 416

EXECUTIVE AND TABULAR SUMMARY OF AIR BAG FIELD EXPERIENCE. VOL. 2, NO. 1. FINAL REPORT

Narrative summaries and tables which describe 92 accidents reported to the National Hwy. Traffic Safety Administration (NHTSA) during the period 1 Sep 1976 to 31 Aug 1977, involving airbag equipped cars, are presented. The information was extracted from the NHTSA files containing in-depth reports by the accident investigation teams from the regional research stations. For each case report, the following data are included: date, location of accident, Dept. of Transportation HS number (when available), type of impact, year and make of airbag equipped vehicle, type of accident, cause of airbag deployment, year and make of other vehicles involved, speed of impact and delta V's (when available), driver and passenger information, their injury codes, damage to the vehicles, and damage codes. The material presented is an update of the Executive and Tabular Summary of Air Bag Field Experience, Vol. 1, No. 1, published in Apr 1977.

by Ann Dalsimer; Lotta Chi
Chi Associates, Inc., Suite 316, 1011 Arlington Blvd.,
Arlington, Va. 22209
NHTSA-8-0180
1978; 82p
Rept. for 1 Sep 1976-30 Aug 1977.
Availability: NTIS

HS-803 419

STATISTICAL ANALYSES OF COMMERCIAL VEHICLE ACCIDENT FACTORS. VOL. 2: SUMMARY REPORT. FINAL REPORT

Procedures for conducting statistical analyses of commercial vehicle accidents have been established and initially applied. A file of approximately 3000 California Hwy. Patrol accident reports from two areas of California (a major portion of the County of Los Angeles and small contiguous sections of Ventura County and Kern County; a cluster of 14 counties surrounding the Sacramento/Lake Tahoe region) during a period of about one year in 1975-1976 provides the data base. Computer implementation and evaluation of the quality of the data file were first accomplished, then an exhaustive univariate analysis of the data was conducted in order to describe the file in detail. Selected sets of dependent and independent variables were then subjected to linear regression analysis. The resulting linear models of the interactions of the variables were found to be unsatisfactory. More complex models of the interactions were then constructed with contingency table analysis (CONTAB) methods, and acceptable log-linear models to explain these interactions were successfully established. Vehicle exposure was introduced into one of these analyses in order to

assess its impact on the set of significant interactions, and was found to be important. The estimation of exposure was carried out by two independent methods, a "direct" procedure based on a series of linear extrapolations of basic California commercial vehicle traffic data, and an "induced" estimation procedure essentially employing only data in the accident reports. While necessarily limited in scope, certain initial accident causation and countermeasure implications related to multi-unit jackknife and brakes-related accidents and accident severity were established from these analyses. The odds of occurrence of a jackknife-before-accident (JKBA), compared to its non-occurrence, are about ten times greater on a wet road than on a dry one, whatever the condition of lockup and number of driving axles (DA). The presence of two DA's significantly decreases the odds of JKBA. The odds of occurrence of a high-severity injury are 2.5 times as great on conventional roads as on freeways or expressways for lightly laden (up to 25,000 lb) semitrailers, and about 1.5 times as great for heavily laden (more than 60,000 lb) full-trailer combinations. The odds that a single-unit, two-axle truck will have a brake-related accident on a downhill road are twice as great as the corresponding odds on a nondownhill road. The analogous result for a five-axle tractor/semitrailer is that the downhill, brake-related accident odds are 4.6 times those for a nondownhill road. The effect of considering economic costs of accidents instead of only their frequency was briefly investigated.

by G. A. Fleischer; L. L. Philipson
University of Southern California, Traffic Safety Center, Los Angeles, Calif. 90007
DOT-HS-7-01565; Ref: DOT-HS-4-00964
Rept. No. USC-ISSM-78-2; 1978; 56p 5refs
Rept. for Feb 1977-Feb 1978.
Availability: NTIS

HS-803 420

EVALUATION OF OCCUPANT PROTECTION DEVICES AND RESTRAINT SYSTEMS. TEST REPORT

In order to gather data for evaluating Volvo air cushion restraint (ACR) systems and conventional Volvo three-point belt restraint systems during a high-speed frontal car-to-car collision, four full-scale tests were conducted. The vehicles used in the first three tests were 1975 Volvo 244's; the fourth test used 1976 Volvo 244's. Anthropomorphic dummies were used in all tests. The matrix of impact conditions, a summary of test results, and complete data from each test are presented.

by Richard W. Carr
Dynamic Science, Inc., 1850 W. Pinnacle Peak Rd., Phoenix, Ariz. 85027
DOT-HS-7-01542
Rept. No. DSI-3994-77-189; 1977; 132p
Rept. for Aug-Oct 1977.
Availability: NTIS

HS-803 442

VEHICLE FOG LIGHTING: AN ANALYTICAL EVALUATION. FINAL REPORT

Analytical research to determine optimum vehicle lighting parameters for effectiveness in fog is accompanied by an extensive literature review, a major output being the definition

HS-803 445

HSL 79-02

of Fog Driving Scenarios that characterize conditions associated with driver problems in fog. A computer simulation of nighttime and daytime fog visibility was developed to assess 26 front-facing and rear-facing vehicle lamp designs and mountings. Results of the computer simulation show that front fog lamps enhance positional comfort-related visual cues more than situational safety-related visual cues, that rear lamps provide the greatest potential for visibility enhancement in fog, that daytime fog is not amenable to visibility improvement, and that the optimum vehicle lighting system for nighttime fog consists of front fog lamps, low-beam headlamps, and relatively high-intensity supplemental rear fog lamps. Results are interpreted against visibility criteria for safe driving speed. Detailed recommendations for optimum parametric lamp design and mounting variables are presented.

by B. W. Koth; W. D. McCunney; C. P. Duerk; M. S. Janoff; M. Freedman
Franklin Inst. Res. Labs., Benjamin Franklin Pkwy.,
Philadelphia, Pa. 19103
DOT-HS-6-01499
1978; 251p 240refs
Rept. for Oct 1967-Mar 1978.
Availability: NTIS

HS-803 445

ENGINEERING MODEL OF FUTURE MOTOR VEHICLES. VOL. 1: FINAL REPORT

An update was made of the Engineering Model of Future Motor Vehicles (EMFMV) computerized data base and program system which provides the safety engineer with passenger car information, such as configuration geometry, weight, performance, and registration data, and a program for statistical analysis and retrieval of the data in various formats including time series trends. The data base was updated to include 1977 model year cars, registrations through 1976, and adjusted records to include the most common engines and configurations. The program extension includes a new subroutine DIAGRM which prints out a graph of the functional relationship between any two variables, and a new operating mode which weights values of any variable with the number of cars registered. Also developed is a list of variables and data sources recommended for a future data file on light trucks and multipurpose vehicles. Appended are a program list, program print-out, and make and model codebook. A supplementary Data Book is available in a separate volume (same date and title).

by H.-W. Grove
Volkswagenwerk A.G., Res. Div., 3180 Wolfsburg, Germany
DOT-HS-5-01273
1978; 109p 1ref
Rept. for Jul 1976-Sep 1977. Vol. 2: Data Book is HS-803 446.
See also HS-802 209.
Availability: NTIS

HS-803 446

ENGINEERING MODEL OF FUTURE MOTOR VEHICLES. VOL. 2: DATA BOOK

A brief introduction is presented to the Engineering Model of Future Motor Vehicles (EMFMV) data base and program system, updated to Jan 1978. The book is intended to be a handy reference guide for the user to operate the program at the terminal. The EMFMV provides the safety engineer with

passenger car information such as configuration, geometry, weight, performance, and registration data, and a program for statistical analysis and retrieval of the data in various formats, including time series trends. Appended are catalogs and coding tables for general data, weight data, and geometric data.

by H.-W. Grove
Volkswagenwerk A.G., Res. Div., 3180 Wolfsburg, Germany
DOT-HS-5-01273
1978; 61p
Rept. for Jul 1976-Sep 1977. Vol. 1: Final Rept. is HS-803 445.
See also HS-802 209.
Availability: NTIS

HS-803 456

DEVELOPMENT OF RECOMMENDATIONS TO IMPROVE CONTROLS OPERABILITY. FINAL REPORT [AUTOMOBILE DRIVER CONTROLS]

Automobile driver controls location and operational modes and expectancies were studied to develop recommendations for modifying Federal Motor Vehicle Safety Standard (FMVSS) 101, Control Location, Identification and Illumination--Passenger Cars, Multipurpose Passenger Vehicles, Trucks and Buses, in order to make the standard a clearer guide to automobile designers, thereby increasing safety. Study phases included a field investigation of driver controls operation expectancies; derivation and review of proposed rulemaking recommendations; analysis of current control option provisions in domestic and foreign vehicles; and preparation of recommendations for modification/improvement of FMVSS 101 and future research standards. Results include the analysis of control operation expectancy data to support specific recommendations for improved driver-controls interface; the identification of several areas of rulemaking in which current information is inadequate; development of a preliminary draft for modifying FMVSS 101; the application of human engineering principles to identification, location, operation, and illumination for automotive controls; and recommendations for needed research to enlarge the data bank. Recommendations for future research include the following: determine which driver controls should be standardized across vehicle types; test the validity of the proposed shift of the window defrost functions from the present environmental function group to the window clearing/visibility group; test the hypothesis that less confusion will occur if an optical horn is grouped with the audio horn (warning function) rather than associated with the headlights (visibility functional group); test the hypothesis that all gear shifting (either manual or automatic) should be located on a column-mounted stalk (primarily to remove time-consuming shifts between ignition switch and floor-mounted gear levers); and evaluate the proposed FMVSS standards in terms of their interaction with other driving visual display standard proposed by previous Dept. of Transportation studies.

by T. L. Black; W. E. Woodson; P. H. Selby
Man Factors, Inc., 4433 Convoy St., San Diego, Calif. 92111
DOT-HS-6-01445
Rept. No. MFI-77-108-(F); 1977; 208p 13refs
Rept. for Jul 1976-Nov 1977.
Availability: NTIS

February 28, 1979

HS-803 461

HS-803 457

**IMPROVED PASSENGER CAR BRAKING
PERFORMANCE. SUMMARY REPORT. FINAL
REPORT**

by R. D. Ervin; J. D. Campbell; M. Sayers; H. Bunch
University of Michigan, Hwy. Safety Res. Inst., Huron Pkwy.
and Baxter Rd., Ann Arbor, Mich. 48109
DOT-HS-6-01368
Rept. No. UM-HSRI-78-12-1; 1978; 29p 1ref
Rept. for Jun 1976-Feb 1978. For abstract, see HS-803 458;
Appendices are in HS-803 459.
Availability: NTIS

HS-803 458

**IMPROVED PASSENGER CAR BRAKING
PERFORMANCE. FINAL TECHNICAL REPORT**

Test conditions were studied as candidates for extending the scope of stopping distance requirements of Federal Motor Vehicle Safety Standard (FMVSS) 105-75, Hydraulic Brake Systems. Conditions of interest included low and split friction surfaces, as well as straight-line braking and braking-in-a-turn maneuvers. Two large test programs were conducted and various analytical efforts were applied to the examination of the candidate test methods and conditions. Throughout the study activities, only stopping distance performance was taken as the measure for evaluating the utility of the candidate conditions and methods. It was concluded that only the low friction, straight-line braking condition constitutes a viable extension of the stopping requirements of FMVSS 105-75. It was also found that stopping distances in a turn do not differ significantly from stopping distances measured in straight-line braking. Furthermore, stopping distances on split friction surfaces do not appear generally useful as characterizations of vehicle safety quality.

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DOT-HS-6-01368
Rept. No. UM-HSRI-78-12-2; 1978; 125p 11refs
Rept. for Jun 1976-Feb 1978. Summary report is HS-803 457;
Appendices are in HS-803 459.
Availability: NTIS

HS-803 459

**IMPROVED PASSENGER CAR BRAKING
PERFORMANCE. APPENDICES. FINAL REPORT**

Appendices are provided to a study of test conditions as candidates for extending the scope of stopping distance requirements of Federal Motor Vehicle Safety Standard 105-75, Hydraulic Brake Systems. Conditions of interest included low and split friction surfaces, as well as straight-line braking and braking-in-a-turn maneuvers. Two large test programs were conducted and various analytical efforts were applied to the examination of the test methods and conditions. Appendices contain data from 12-car survey test program (vehicle descriptions and data summaries); calculated results of a quasi-static analysis; data from in-depth test program on five cars (vehicle descriptions and data summaries); simulation results using dynamic braking model; evaluation of the accuracy of simplified methods for computing reference vehicle ideal stopping

distance for the braking efficiency test technique; antilock braking model; and test sequence and procedure.

by R. D. Ervin; J. D. Campbell; M. Sayers; H. Bunch
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DOT-HS-6-01368
Rept. No. UM-HSRI-78-12-3; 1978; 199p
Rept. for Jun 1976-Feb 1978. Summary Rept. is HS-803 457;
Final Rept. is HS-803 458.
Availability: NTIS

HS-803 461

**SAFE PERFORMANCE CURRICULUM
PERFORMANCE MEASURES DEVELOPMENT.
FINAL REPORT**

A study was undertaken to develop a reliable measure of driving performance that could serve as an intermediate criterion for high school driver education curricula, and to develop a test that could predict perceptual skills in driving. A Driving Performance Test was developed which requires 30 minutes, both a driving instructor and a trained coder, and a standard route where traffic meets specifications. Inter-rater agreement is good and the reliability of the test is very high. The test is capable of revealing both curricular and individual deficiencies. Data were obtained from more than 350 drivers in five age groups and significant age/experience effects were found. The use of the test in studying deficiencies of elderly drivers is recommended. In a second comparison of nearly 100 additional drivers, no differences were found in stability of performance between experienced and novice drivers when two runs were made within one and one-half hours. Further study to identify the sources of variance in test scores is recommended. Driver Education students are inferior to mature, experienced drivers on most performance variables, but superior in a few variables emphasized in Driver Education (e.g. backing). It is recommended that this test be validated in the Safe Performance Curriculum Demonstration Project, for use as an evaluation criterion for Driver Education curricular innovations. Four tests of perceptual skills relevant to the driving task were developed, based on a model of the visual task in driving (Perception of Hazards, Mirror Usage, Peripheral Information Processing, and Scanning Efficiency); three of these (all but the Peripheral Information Processing) are significantly correlated with scores on the Driving Performance Test where perceptual skills are required. It is recommended that the predictive efficiency of these tests be further explored. Appendices contain an Administrator's Manual, a Supervisor's Manual, a Route Construction Manual, a Scoring Manual for Coders, a Scoring Manual for Examiners, and a Perceptual Skills Tests Manual.

by Margaret Hubbard Jones
University of Southern California, Traffic Safety Center,
University Park, Los Angeles, Calif. 90007
DOT-HS-5-01263
1978; 238p 44refs
Rept. for Jul 1975-Mar 1978. Cover title: Driver Performance
Measures for the Safe Performance Curriculum.
Availability: NTIS

HS-803 462

COMPLIANCE AND CRASHWORTHINESS TESTS ON AN ELECTRIC VEHICLE, 1975 METRO- ELECTRIC 4-DOOR SEDAN. FINAL REPORT

In order to obtain some basic crash information on a full-size electric vehicle, compliance and crashworthiness tests were conducted on a 1975 Metro-Electric (Electric Vehicle Associates) 4-door sedan. Pendulum and low-speed barrier impact tests were performed to determine compliance with Federal Motor Vehicle Safety Standard (FMVSS) 215, followed by a 30-mph frontal fixed-barrier crash test to determine the degree of compliance with FMVSS 204, 212, and 301, as well as to obtain data relative to fire and electrical hazards, crashworthiness, etc. In the 30-mph barrier crash an instrumented Part 572 dummy occupied the right front passenger seat. Since bumper height did not meet the requirements of FMVSS 215, the vehicle is in apparent noncompliance with this standard. The steering column moved horizontally rearward a distance of 4.0 in, measured relative to a fixed point in the occupant compartment; it, therefore, meets the requirements of FMVSS 204. Approximately 9-1/8 in of windshield retention was lost along the upper edge on the left side and 3 in on the right side; retention remaining was 118.4 in or 91%; the windshield was struck by the steering wheel in its upward rotation; the vehicle therefore, meets the requirements of FMVSS 212. During impact, the cap on the heater gas tank popped off and approximately three quarts of Stoddard Solvent were lost; the vehicle, therefore, fails to meet the requirements of FMVSS 301. During impact, the brake master cylinder mounted on the firewall was driven into one of the front traction batteries causing a direct short circuit, resulting in a smoldering fire of the battery which was extinguished only after the batteries were disconnected at the main terminals. Following the impact, a voltmeter was used to measure the voltage differential between the vehicle body and earth, and a voltage difference of 14 volts was measured. A voltage difference of 48 volts was measured between the batteries and the vehicle body. The Part 572 dummy developed an HIC (Head Injury Criteria) of 631 and CSI (Chest Severity Index) of 262.

by E. Enserink
Dynamic Science, Inc., 1850 W. Pinnacle Peak Rd., Phoenix,
Ariz. 85047
DOT-HS-5-01104
Rept. No. DS-3967-77-83; 1977; 78p
Rept. for May-Jun 1977. In Doc-2-6 as HS-802 543.
Availability: NTIS

HS-803 463

90-DEGREE DOLLY ROLLOVER TEST OF AN ELECTRIC VEHICLE PER FMVSS 208 TEST PROCEDURE, 1977 ELECTRA-VAN 500. FINAL REPORT

A 1977 Electra-Van 500, NHTSA (National Hwy. Traffic Safety Administration) No. 771003, was tested in accordance with the Federal Motor Vehicle Safety Standard (FMVSS) 208 rollover test procedure. Although FMVSS 208, Occupant Crash Protection, is concerned primarily with the occupant response during the rollover, other objectives of this test included determining the structural integrity of the entire vehicle and the response of the vehicle traction batteries. The test speed was 29.56 mph. The vehicle came to rest in the 492 degrees position and suffered extensive body deformation. Several windows either shattered or completely lost retention;

the left rear axle sheared and the right front spindle cracked. Tools were required to open all doors except the rear door which opened during the roll. The traction batteries were not damaged in the roll. They were leaking slightly when the vehicle came to rest, but the leakage ceased when the vehicle was returned to its upright position. The Part 572 dummy which occupied the right front passenger seat developed an HIC (Head Injury Criteria) of 350 and a Chest Severity Index (CSI) of 274. The peak resultant head and chest accelerations were 148 G and 58 G, respectively.

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Dynamic Science, Inc., 1850 W. Pinnacle Peak Rd., Phoenix,
Ariz. 85027
DOT-HS-5-01104
Rept. No. DS-3967-77-188; 1977; 62p
Rept. for Oct 1977.
Availability: NTIS

HS-803 464

THE CONTRIBUTIONS OF AUTOMOBILE REGULATION. PRELIMINARY REPORT

Charges by auto industry executives and others that the industry is being overregulated and harmed economically by Federal regulation, are addressed. These critics state that Federal regulations impede growth, stifle innovation, and hamper the industry's ability to compete internationally. Fundamental issues raised by these criticisms are examined and include the following: the need for regulation, how responsibly the regulatory process is carried out, the costs imposed on the industry, and the overall effect of the National Hwy. Traffic Safety Administration's (NHTSA) rulemaking on the industry and the economy. NHTSA's responsibility to improve safety is warranted by the annual loss of 47,000 lives and the millions of injuries in motor vehicle crashes (an economic loss to society estimated at \$43 billion). NHTSA's estimate of the average price to consumers of safety features contained in a model year 1978 automobile is only about \$250, approximately half the amount claimed by some auto makers. Both safety standards and fuel economy regulations create challenges to the industry's technological potential, challenges which can be achieved by the industry and which are amply justified by the health and economic benefits to the public, by a decreased reliance on foreign sources of oil, and by savings to consumers in fuel costs. NHTSA does not agree with charges that its standards adversely affect competition; instead, it feels that they promote competition by requiring compliance with uniform performance, not design, standards and by issuing fuel economy standards which could make domestic manufacturers more competitive with smaller, more fuel-efficient foreign cars. NHTSA's safety regulations have been a major factor in the steadily declining fatality rate. The increasing number of vehicle recalls because of safety defects may be illustrative of the failure of industry to provide maximum safety, and demands a continuing Federal role. The price to the consumer for a 1984 passenger car, above that for a 1978 model, of major future safety, consumer, and fuel economy rules is estimated at \$285; but consumers should realize a net vehicle lifetime operating savings of about \$500 for a 1984 vehicle vs. a 1978 vehicle. NHTSA believes that the large domestic auto firms generally have not been as innovative as the smaller foreign firms. Profitability and sales of the industry are largely a function of the state of the economy, rather than of regulation. Finally, fuel economy standards set for model years 1981-1984 require capital investments within the industry's capability; the industry's historical annual capital invest-

ments are nearly six times as large as the capital expenditures required to make fuel economy improvements.

National Hwy. Traffic Safety Administration, Office of Plans and Programs, Washington, D.C. 20590
1978; 40p 6refs
Availability: Corporate author

HS-803 525

SUBSTITUTE FOAMING AGENT FOR THE MANUFACTURE OF PART 572 DUMMY FLESH COMPONENTS. FINAL REPORT. PT. 3

The third part, laboratory evaluations, of a report on work undertaken to find a substitute foaming agent for Nitrosan in the manufacture of vinyl foam flesh parts of crash test dummies conforming to the Code of Federal Regulations, Chapter 49, Part 572, is presented. The study evaluated Part 572 dummy flesh/skin components produced by Humanoid Systems of Carson, Calif., and Alderson Res. Labs., Inc. of Stamford, Conn., by means of the new OBSH/TBPP (p,p'-oxybis(benzene sulfonyl hydrazide)/t-butyl peroxyvivate) flesh foam formulations; in addition, analogous Nitrosan parts were evaluated. Overall, the newly examined parts were similar in quality to parts manufactured by Sierra Engineering Co. of Sierra Madre, Calif. and evaluated in the second part of the report. Some individual parts showed deficiencies correctable by minor procedural changes. Other differences between individual OBSH/TBPP parts from different suppliers were comparable to differences in Nitrosan analogues and may be attributable to diverse materials sources and individual molding techniques. The evaluation revealed no substantial deficiencies or property differences in the new parts relative to Nitrosan analogues. As with Nitrosan parts, further improvements in quality and uniformity may be expected with continued manufacturing experience. Drop-weight impact test data are appended.

by William P. Whelan, Jr.; Martin I. Jacobs
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Middlebury, Conn. 06749
DOT-HS-6-01326
Rept. No. FR-DOT-HS-6-01326; 1978; 26p
Pt. 1 is HS-802 030; pt. 2 is HS-803 526. Complete rept. is HS-803 387 (PB-283 396).
Availability: Reference copy only

HS-803 526

SUBSTITUTE FOAMING AGENT FOR THE MANUFACTURE OF PART 572 DUMMY FLESH COMPONENTS. FINAL REPORT. PT. 2

The second part, production of dummy flesh parts with the newly developed blowing agent system, of a report on work undertaken to find a substitute foaming agent for Nitrosan in the manufacture of vinyl foam flesh parts of crash test dummies conforming to the Code of Federal Regulations, Chapter 49, Part 572, is presented. Vinyl flesh/skin parts suitable as components for the Part 572 Anthropomorphic Test Dummy were successfully and reproducibly manufactured at a commercial facility, the Sierra Engineering Co. of Sierra Madre, Calif., without the use of Nitrosan. All components of the new flesh formulations are commercially available from domestic suppliers. The new blowing agent comprises a combination of p,p'-oxybis(benzene sulfonyl hydrazide) and t-butyl peroxy-

vivate (OBSH/TBPP). The new flesh formulations are closely related to currently specified Nitrosan formulations. Molding procedures are closely similar to those employed for Nitrosan parts. Correspondence of the new flesh foams to their Nitrosan counterparts has been detailed by an extensive comparison of properties of both laboratory moldings and dummy part specimens. Drop-weight impact test data are appended.

by William P. Whelan, Jr.; Martin I. Jacobs
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DOT-HS-6-01326
Rept. No. FR-2-DOT-HS-6-01326; 1977; 66p
Pt. 1 is HS-802 030; pt. 3 is HS-803 525. Complete rept. is HS-803 387 (PB-283 396).
Availability: Reference copy only

HS-803 540

SAFETY RELATED RECALL CAMPAIGNS FOR MOTOR VEHICLES AND MOTOR VEHICLE EQUIPMENT, INCLUDING TIRES, REPORTED TO THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION BY DOMESTIC AND FOREIGN VEHICLE MANUFACTURERS, APRIL 1, 1978 TO JUNE 30, 1978

This tabulation of safety defect recall campaigns includes the NHTSA identification number, date of company notification, make, model, model year, number of pages on file, number of vehicles recalled, and brief description of defect and manufacturer's corrective action. Buses, automobiles, postal vehicles, trucks, trailers, travel trailers, tank trailers, motorhomes, school buses, motorcycles, mopeds, roof glass panels, engine fans, electronic speed controls, anti-lock systems, hydraulic floor jacks, seatbelt assemblies, air-conditioning units, furnaces, slide-in campers, fuel tanks, and tires are included. The status of domestic and foreign campaigns completed as of 31 Mar 1978 is also provided.

National Hwy. Traffic Safety Administration, Washington, D.C. 20590
1978; 45p
Availability: GPO

HS-803 548

A METHOD OF CORRECTING TIRE TRACTION DATA FOR CHANGES IN TEST SURFACE CONDITIONS AND A DEFINITION OF PRECISION AND ACCURACY REQUIREMENTS FOR TIRE TRACTION TESTS

Because precision and accuracy statements in certain ASTM (American Society for Testing and Materials) tire traction standards appear to be wrong, a method is proposed of correcting tire traction data using control tires. Precision and accuracy requirements for tire traction tests are defined, based on rigorous statistical methods. The correction method consists of establishing a daily trend for surface friction change by means of a least-squares line through control tire measurements performed at intervals throughout each day. The correction factor for a test tire is the ratio of the control tire grand mean to the value on the daily control tire trend line which corresponds to the running of the test tire. In order for the correction method to have validity, the control tire must be similar to the test

tires in its sensitivity to surface changes and the control tests must be the same as the tests performed on the other tires. An example is provided of the analysis required for any traction test, using data from a cornering test run according to ASTM F 376-73.

by P. L. Boyd; A. H. Neill, Jr.; J. Hinch
 National Hwy. Traffic Safety Administration, Tire Systems
 Div., Washington, D.C. 20590
 Rept. No. NHTSA-TN-T-1033; 1977; 16p 5refs
 Prepared for publication in *Tire Science and Technology*.
 Availability: Reference copy only

HS-803 549

SELECTION GUIDE FOR HIGH SPEED POLICE PURSUIT TIRES (TRACTION). FINAL REPORT

Since selection of police pursuit tires for their wet traction capabilities is a necessary task made difficult by the lack of comparative information on different brands, constructions, and sizes, a study was conducted, using established test procedures, of a group of high-speed pursuit tires for their braking, cornering, and driving potentials. These tests have shown that certain changes would improve the test procedures in American Society for Testing and Materials (ASTM) standards F 403, F 376, and F 424. Certain revisions to these standards are recommended. The data from the tire study are summarized, and the rankings of the tires in braking, cornering, and driving are established. Because the experimental error was kept small, some tires have been identified as significantly better than others. The following tire types were tested: Armstrong High Speed Pursuit 70, Dunlop Gold Seal, Dunlop Elite, BFG Pursuit Radial, Goodyear Police Special F (Flexten), Goodyear Police Special P, Michelin Radial, Pirelli Radial, and Firestone Super 125 (2 sizes). Radial tires performed better than the bias ply tires in five out of six of the measured properties. The H70 series tires stopped better than the H78 series tires, but in cornering and accelerating, there was no significant difference. The Goodyear Flexten tire stopped in a shorter distance than any other tire and appeared in the best group of tires in cornering, braking, and driving. Its overall performance was consistently better than any of the other tires. The three ASTM standards (ASTM F 403-74, Standard Method of Testing Tires for Wet Traction in Straight Ahead Braking Using Highway Vehicles; ASTM F 376-73, Standard Method of Testing Tire for Wet Traction in Cornering Without Driving Torque Application Using Highway Vehicles; and ASTM F 424-75, Standard Method of Testing Tires for Wet Driving Traction in Straight Ahead Motion Using Highway Vehicles) are appended.

by A. H. Neill, Jr.; J. A. Hinch
 National Hwy. Traffic Safety Administration, Tire Systems
 Div., Washington, D.C. 20590
 Rept. No. NHTSA-TN-T-1020; 1976; 55p refs
 NBS-P.O.-613229
 Availability: Reference copy only

HS-810 326

REMARKS BEFORE THE ITA/OVERDRIVE CONVENTION, WASHINGTON, D.C., JULY 28, 1978

The National Hwy. Traffic Safety Administration (NHTSA) presents its case in wanting to work with the independent truckers, to exchange ideas, to achieve better mutual un-

derstanding, and to begin to solve some of the problems in safety, in energy, and in the area of human factors. NHTSA's upcoming "Double Nickel Challenge: Race to the Fuel Pump" event in Ohio is cited as a beneficial joint study. Factual fuel economy vs. speed test results of owner-operators driving their own rigs will be obtained during the event, with every step of the tests open to the public. It is hoped that independent truckers will observe the testing to satisfy themselves that the demonstration is equitable, and that "Overdrive" and all the other trade publications will convey the results in an equally open and unbiased fashion. Independent truckers are also invited to participate in other NHTSA programs, such as a Federal Motor Vehicle Safety Standard 121 demonstration program in which owner-operators could make valuable contributions, and to partake of the information and experience NHTSA is gathering on the equipment that will save truckers fuel and money. One issue now in rulemaking is cited as important to the truckers, truck rear underride protection. A film, prepared by the Insurance Inst. for Hwy. Safety on the subject, is presented to illustrate this highway safety issue. Finally, proposed legislation concerning truck size is cited as being of common interest to NHTSA and truckers. This legislation, if enacted, would permit lengthening the cabs of fleet trucks to permit adequate driver space and improved ride quality; it would also permit truckers to operate longer conventional tractors with sleeper berths, without having to avoid certain states or turn down long loads.

by Joan Claybrook
 National Hwy. Traffic Safety Administration, Washington,
 D.C. 20590
 1978; 6p
 Availability: Corporate author

HS-810 326

REMARKS BEFORE THE AAAM-IAAM [AMERICAN ASSOCIATION FOR AUTOMOTIVE MEDICINE/INTERNATIONAL ASSOCIATION FOR ACCIDENT AND TRAFFIC MEDICINE] INTERNATIONAL MEETING, UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN, JULY 10, 1978

Contributions by doctors, public health professionals, and medical societies to the field of automotive safety are reviewed, and achievements made as a result of the National Hwy. Traffic Safety Administration's (NHTSA) medical research on human trauma are outlined. The following contributors are cited: Dr. William Haddon (framed the broad range of programs in two highway safety acts passed in 1966; senior author of 1968 Alcohol and Highway Safety Report submitted to Congress; principal author of "Accident Research: Methods and Approaches," a basic work in field of loss reduction; effectively articulated the need for passive protection systems for car occupants, and has made the insurance industry a major force working for improved safety); Colonel John Stapp (contributed fundamental knowledge on human tolerance to deceleration forces); Dr. Paul Gikas (delivered key testimony to Congressional committees to show the direct relationship between injury and automotive design and led to 1966 traffic safety legislation); Dr. Alan Nahum (did much human tolerance work on which present research efforts are based); Dr. Harold A. Fenner (initiated American Medical Assoc. support for police-physician investigation teams); Dr. Robert S. Sanders (instrumental in promoting unique legislation in Tennessee for the protection of children in motor vehicles).

cles); Dr. Fletcher Woodward (wrote several important articles on auto safety); Dr. Horace Campbell (a vociferous advocate for highway safety before the Federal regulatory program); Dr. Ross McFarland (explored human factors involved in motor vehicle safety); Dr. Julian Waller (a leader in alcohol research and other aspects of highway safety); Dr. John States (a major contributor in accident investigation and traumatology); and Ms. Susan Baker (specialist since 1967 in injury control and highway safety). A number of public health societies have also made strong contributions to public policy decisions in automotive safety, and a number of medical societies have been very effective in explaining the value of technological preventive medicine (e.g. passive restraints). Contributions of NHTSA to biomedical research include development of a standard codification system for reporting the magnitude and location of brain damage; development of data on the properties of the human chest by instrumenting mechanical resuscitators to obtain force-deflection relationships; development of extensive data on the strength of femurs and ribs by cadaver research; development of standard procedures for examining and reporting neck injuries in autopsies; and preparation of an anatomical atlas of the child's body. Two other areas of related interest are NHTSA's recent lab and field investigations on how alcohol impairs driver performance, and its National Center for Statistics and Analysis, for collecting and storing accident data. NHTSA is considering a peer review research program and is recruiting to add for the first time several medical doctors or advanced public health specialists to its staff.

by Joan Claybrook
 National Hwy. Traffic Safety Administration, Washington,
 D.C. 20590
 1978; 15p 1ref
 Availability: Corporate author

HS-810 327

IS THERE NO END IN SIGHT? [MOTOR VEHICLE REGULATION]

The past and future of motor vehicle regulation in the U.S. are discussed, including the social, political, and economic forces that produced a need for motor vehicle performance standards, and the legislative actions which created the statutory mandate for such standards. In discussing the impacts of the standards, the thesis is advanced that the advent of regulation has contributed to revolutionary and beneficial changes in the criteria and methodology of automotive engineering; that the new requirement to satisfy objective criteria of performance has stimulated a dramatic transition from art to science in automotive design. The future of motor vehicle regulation is considered, including the National Hwy. Traffic Safety Administration's (NHTSA) plans for rulemaking over the next several years, and a prognosis as to the likelihood of putting an end to such government regulation. It is believed that either of two conditions must be satisfied before it will become appropriate for the government to discontinue regulation. One condition is the unlikely absence of feasible technological approaches for further improvement of the socially desirable attributes of the automobile. There are high hopes that continuing technological developments, especially in materials technology, microelectronics, and the methodology of vehicle performance measurement and analysis, will open up promising new opportunities. The second condition that would render additional regulation inappropriate would be the elimination of the disparity between the attributes of the automobile deemed necessary from a broad social viewpoint and those sought by the in-

dividual consumer in pursuit of personal interest. This condition is believed to be attainable.

by Howard Dugoff
 National Hwy. Traffic Safety Administration, Washington,
 D.C. 20590
 1978; 19p 2refs

Prepared for presentation at 1978 Automotive News World Congress, Detroit, 24 Jul 1978.

Availability: Corporate author

HS-810 328

STATEMENT BEFORE THE SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS, HOUSE INTERSTATE AND FOREIGN COMMERCE COMMITTEE, CONCERNING BIOMECHANICS RESEARCH, JULY 21, 1978

The continuation of human cadaver testing as part of the National Hwy. Traffic Safety Administration's (NHTSA) biomechanics research program is advocated. NHTSA agrees completely with the House Subcommittee on Oversight and Investigations' statement of 25 Oct 1977, that the use of human subjects for biomechanics research must be justified by a truly compelling need. DOT has undertaken a complete review of the premises that underlie the NHTSA biomechanics program and of the procedures and checks that are exercised in the use of human subjects. The National Acad. of Sciences, at the request of NHTSA, also undertook an independent review of the biomechanics program and unanimously concluded that the NHTSA rulemaking program justifies continued testing with human cadavers. Careful review of these studies within DOT has convinced both the Secretary of Transportation and the National Hwy. Traffic Safety Administrator that NHTSA cannot properly fulfill its responsibilities for the development of motor vehicle safety standards without the benefit of vital biomechanical information provided by such research. Strict procedures and guidelines will be used to ensure that this research is conducted only when essential and when no other technique is available, and to guarantee the rights, privacy, and dignity of the subjects of the research.

by Joan B. Claybrook
 National Hwy. Traffic Safety Administration, Washington,
 D.C. 20590
 1978; 4p
 See also HS-810 329.
 Availability: Corporate author

HS-810 329

STATEMENT BEFORE THE SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS, HOUSE INTERSTATE AND COMMERCE COMMITTEE, CONCERNING BIOMECHANICS RESEARCH, JULY 21, 1978

The status of the National Hwy. Traffic Safety Administration's (NHTSA) biomechanics research program is addressed, with particular reference to human cadaver testing. It is generally acknowledged that Federal Motor Vehicle Safety Standard (FMVSS) 208 (requiring vehicle manufacturers to provide automatic, or passive, protection to front-seat occupants in a representative frontal crash) and the various other crashworthiness standards issued by the Dept. of Transportation (DOT) since passage of the Vehicle Safety Act have made

a major contribution to the reduction of deaths and injuries on U.S. roads. Nevertheless, the existing standards do not adequately address all of the major crash and injury modes that result in substantial losses. NHTSA is currently pursuing the following three priority rulemaking actions that require new knowledge of the mechanics of human injury and improvements in surrogate testing devices: a near-term upgrading of the side-impact standard; a longer range extension and integration of the various aspects of vehicle occupant protection in frontal, side, rear, and rollover crashes; and development of new pedestrian protection standards. The current NHTSA test dummy (FMVSS 208) was designed to simulate the living human in a seated position, and it best simulates human motion in the fore-and-aft direction. It does not measure all the important injury modes for either side impact or pedestrian testing. The biomechanics data required for necessary improvements in motor vehicle safety are derived from field observation of real-world crashes, laboratory testing with animals and cadaveric specimens, human volunteer tests, and mathematical modeling and analysis. DOT could continue its crashworthiness rulemaking without further human cadaver testing, but the pace would be far slower, and the results would be likely to fall short of protection against the full range of preventable crash injuries. NHTSA has developed a draft ethical statement entitled "Protection of the Rights and Dignity of Cadaver Subjects Utilized in Experiments" as the agency's basic policy on the use of cadavers in research. Two panels will be created to oversee cadaver use in this research in order to ensure that any proposed or ongoing research utilizing cadavers is absolutely essential, that it is designed to obtain the maximum amount of information from each test, and that the contractor's detailed protocol and procedures meet NHTSA's guidelines and requirements.

by Howard Dugoff
National Hwy. Traffic Safety Administration, Washington,
D.C. 20590
1978; 7p
See also HS-810 328.
Availability: Corporate author

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